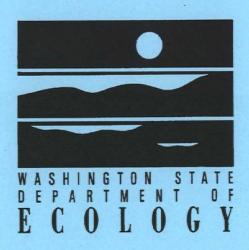
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FORMERLY USED DEFENSE SITE LARSON AFB TITAN MISSILE FACILITY S-3 WASHINGTON STATE DEPARTMENT OF ECOLOGY

February 7, 2000



Prepared by Guy Barrett, Toxics Cleanup Program



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Initial Investigation at the Formerly Used Defense Site Larson AFB Titan Missile Facility S-3

A. Introduction

The Washington State Department of Ecology (Ecology) Toxics Cleanup Program has decided to perform initial investigations, including sampling, at eight Formerly Used Defense Sites (FUDS) in Washington State which have previously been classified as requiring No Further Action (NoFA) by the Seattle District Corps of Engineers. The FUDS Larson AFB Titan Missile Facility S-3 is one of these sites.

The subject site, former Larson AFB Titan Missile Facility S-3, is located in Grant County near Royal City, Washington at latitude 48 degrees, 06 minutes, 49 seconds North and longitude 123 degrees, 29 minutes, and 13 seconds West. The Larson AFB Titan Missile Facility S-3, located in Royal City, Washington was formerly used by the Air Force between 1962 and 1966 as a Titan intercontinental ballistic missile (ICBM) launch site (Figure 1). Aboveground structures consisted of a gatehouse, entry portal, air intake and exhaust structures, sewage stabilization pond, spray pond, and security fencing. Subterranean structures included a "hard" launch facility, with three missile launch complexes, each with three vertical missile silos, propellant and equipment terminals, two radar antennae silos, air intake and exhaust structures, control center, powerhouse, access portal, and an interconnecting steel tunnel system. Two deep wells, one 800 feet and one 915 feet, supplied the water for the two 30,000 gallon underground water tanks which serviced the facility.

Various hazardous, flammable and/or explosive materials were used, stored and disposed of on-site during the period of operation of the facility. These included diesel oil, RP-1 fuel (kerosene), lubrication oil, hydraulic fluid, solvents, de-greasers, transformer fluids (PCB's), nickel-cadmium batteries, liquid oxygen, nitrogen and helium. In most cases, these substances were held in tanks housed inside the facility or buried adjacent to it. Storage capacities indicate the following volumes of selected substances were present routinely at the site; 40,000 gallons of RP-1; 134,000 gallons of diesel oil; 24,500 gallons of liquid gas; 78,000 gallons of liquid oxygen; 3500 gallons of sulphuric acid, and nine clusters of high pressure tanks containing helium and nitrogen. While liquid oxygen, nitrogen and helium were potentially hazardous substances during the operation of the site, they are no longer stored at the site and are not a focus of this project. Some of the organic and inorganic substances formerly present at the site may still be present, such as PCBs and metals. It is known that solvents and degreasers were stored, used, and disposed at this facility. Analysis of contaminants at similar properties have revealed trichloroethylene, perchloroethylene, and toluene which may have been used as solvents and degreasers.

Chlorinated solvents may have been used in the missile and propellant silos, power house dome, and released into the sanitary drain system via sump pumping, and thereby possibly getting into the soil. Diesel fuel and kerosene used in the silos and power house were discharged to drain fields and ditch areas. Metals may exist at the site due to impurities in fuel, machinery, lead-based paint, or waste oils. PCB's may be present in paints (used for durability), transformers, and hydraulic fluid releases.

The Royal City site was declared excess in 1966, and salvage operations were carried out under the direction of the Air Force followed by private contractors. Condition of the facility is poor and no post-DOD use has been made of it. During Air Force salvage operations, the two water supply wells in the powerhouse were cut off at floor level and left uncapped. Subsequent flooding of the facility has occurred, possibly allowing contamination to enter the groundwater through these wells. It is also not known whether all underground storage tanks were removed from this facility.

In 1975, the local irrigation district abandoned a nearby well due to high iron bacteria content. Since it was thought that materials left in the missile facility might be the cause of the contamination, the Environmental Protection Agency inspected the facility and took two composited samples from the standing water in the powerhouse. The analytical results revealed several heavy metals (cadmium, lead, thallium, zinc, chromium, and copper) and one semi-volatile organic (bis [2-ethyl hexyl] phthalate) were present in the water.

The Model Toxics Control Act, (MTCA) Ch. 70.105D RCW, authorizes Ecology to adopt rules necessary to identify, investigate, and clean up hazardous waste sites in Washington State. The regulation Ecology has adopted, Ch. 173-340 WAC, clarifies the roles of both Ecology and owners or operators of facilities where hazardous substances have come to be located, and encourages public involvement in the decision-making at these facilities.

B. Executive Summary

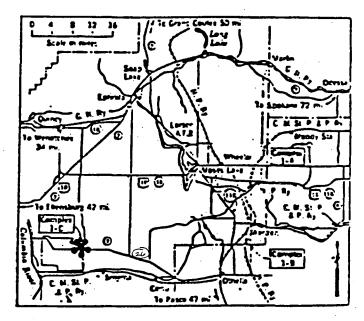
Ecology's investigation is designed to confirm or deny the presence of potential soil and groundwater contamination resulting from past Department of Defense practices. The overall goal of the proposed investigation is to determine the need for additional investigation or to support the belief that no further investigation or cleanup activity is warranted.

The original site is located near Royal City in Grant County, Washington (Figure 1). The Department of the Air Force, Strategic Air Command, acquired 313.74 acres between 1959 and 1963 by negotiated purchase, condemnation or donation for construction of a Titan Intercontinental Ballistic Missile (ICBM) launch site. The Air Force constructed a "hard" launch facility with an underground complex consisting of three missile launch complexes, each with three missile silos, propellant and equipment terminals, two radar antenna silos, air intake and exhaust structures, powerhouse, control center, access portal, and an interconnecting steel tunnel system.

Ecology obtained samples on December 9, 1999 at only a few select locations in upland soil and confined water. Based on analysis of the soil and water samples, Ecology found that contaminants were not present at levels that exceed the MTCA. Established using the results of this limited sampling, Ecology therefore concurs with the U.S Army Corps of Engineers No Further Action required determination for soil and groundwater contamination that may have been caused by past military activities. However, Ecology encourages future efforts that we understand may be made by the U.S. Army Corps of Engineers to better characterize this site.

C. Sampling Locations

Based on previous knowledge gained from investigations of the Larson Titan S-2 site, Ecology inspected the property looking for historical locations of potential sources of contamination that may not have been beneficially used since DOD vacated the property. An inspection of the buildings and undeveloped areas allowed Ecology to refine sampling locations. A general layout of the Larson AFB Titan Missile Facility S-3 site is provided with sampling locations identified (Figure 2). At each sample location, soil was collected from a depth interval of 0 to 2 inches with clean, stainless steel spoons and placed in precleaned sample jars provided by Manchester Laboratory. Sample containers were labeled at the time of sampling with the project name, sampler's initials, sample location and depth, analysis to be performed, date, and time. Samples were transferred with a completed chain of custody form to the Manchester Laboratory including sample identification, sampler's signature, date and time of sample collection, sample matrix, signatures of others in the chain of possession, and inclusive dates of possession. Sampling equipment that was not disposable was decontaminated by scrubbing and rinsing with distilled/deionized water. Sampling activities were documented in a field logbook. Samples were shipped to the lab in a cooler cooled to 4 degrees Celsius with ice and in a manner to ensure that holding times were not exceeded.



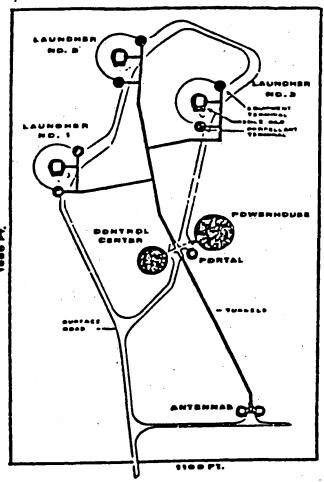
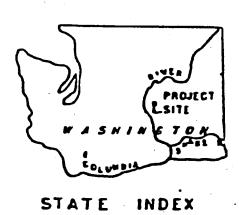


FIG. 1.—TYPICAL LAUNCH COMPLEX

VICINITY MAP

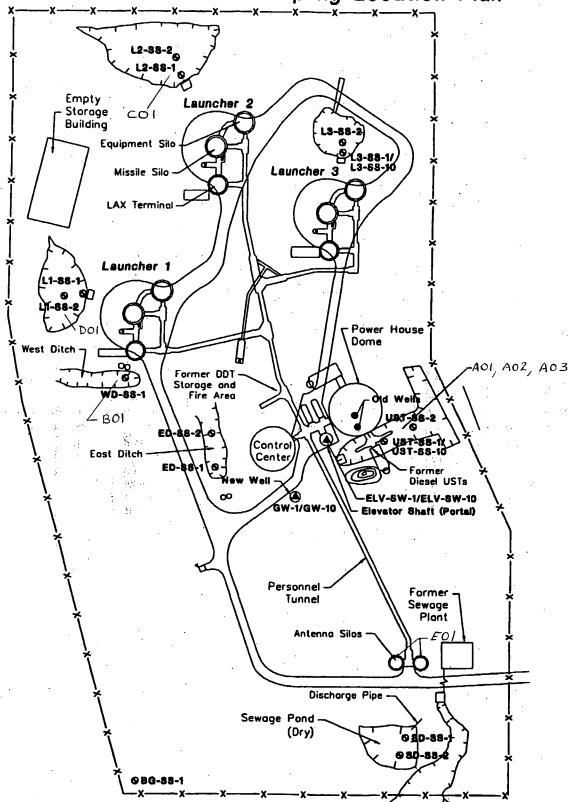


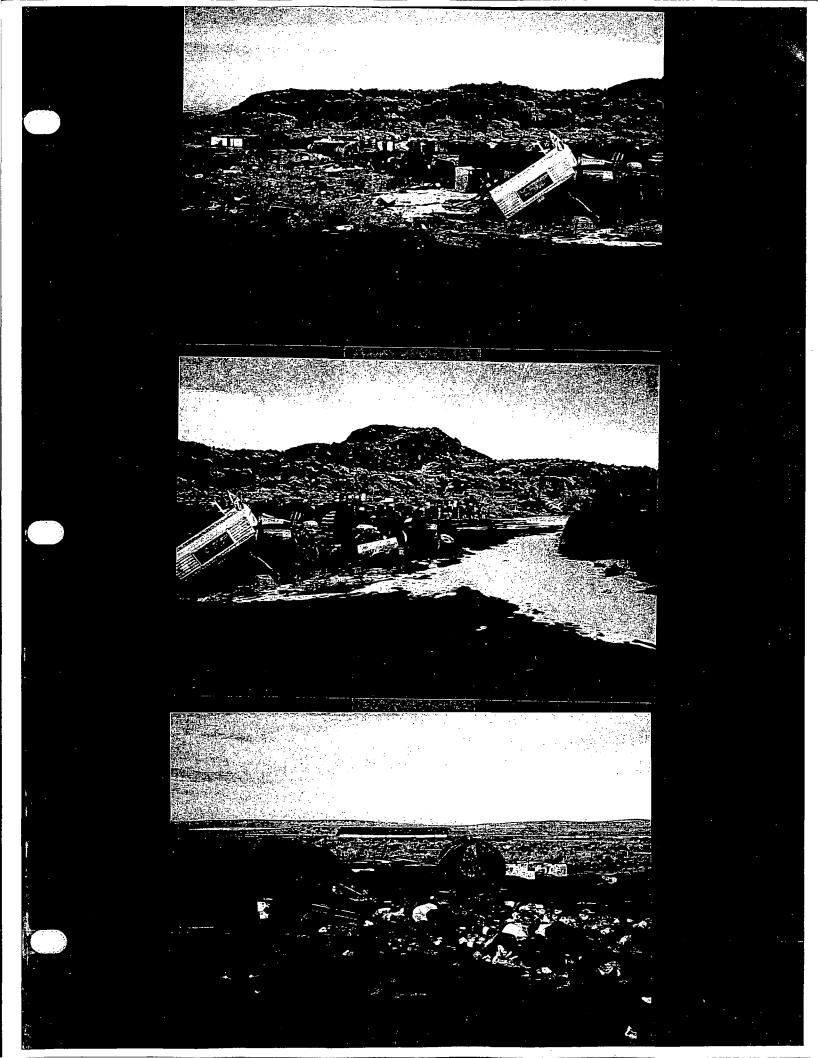
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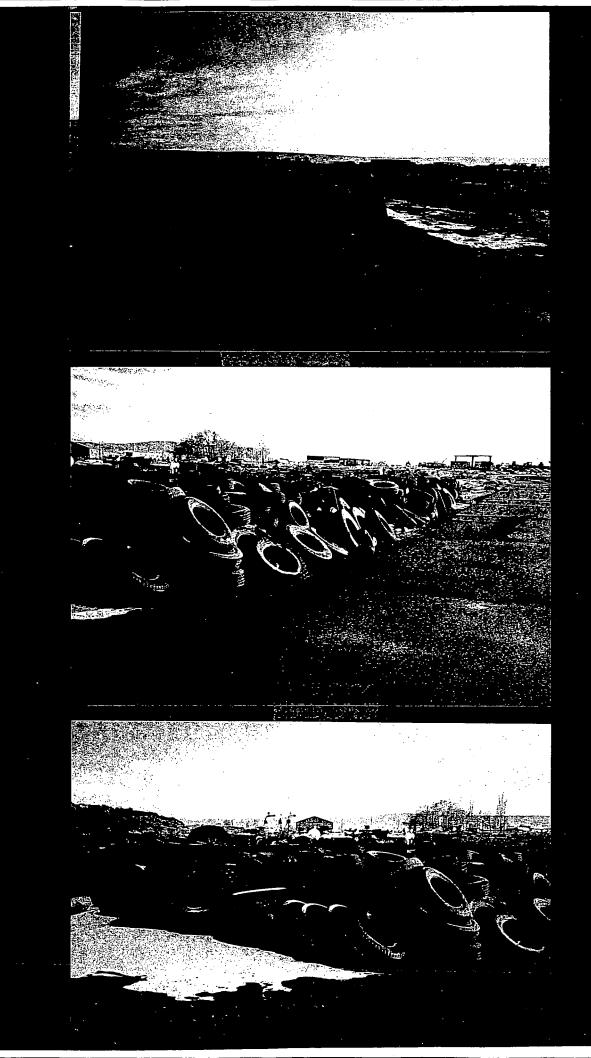
LARSON AFB AF TITAN MISSILE FACILITY S-3

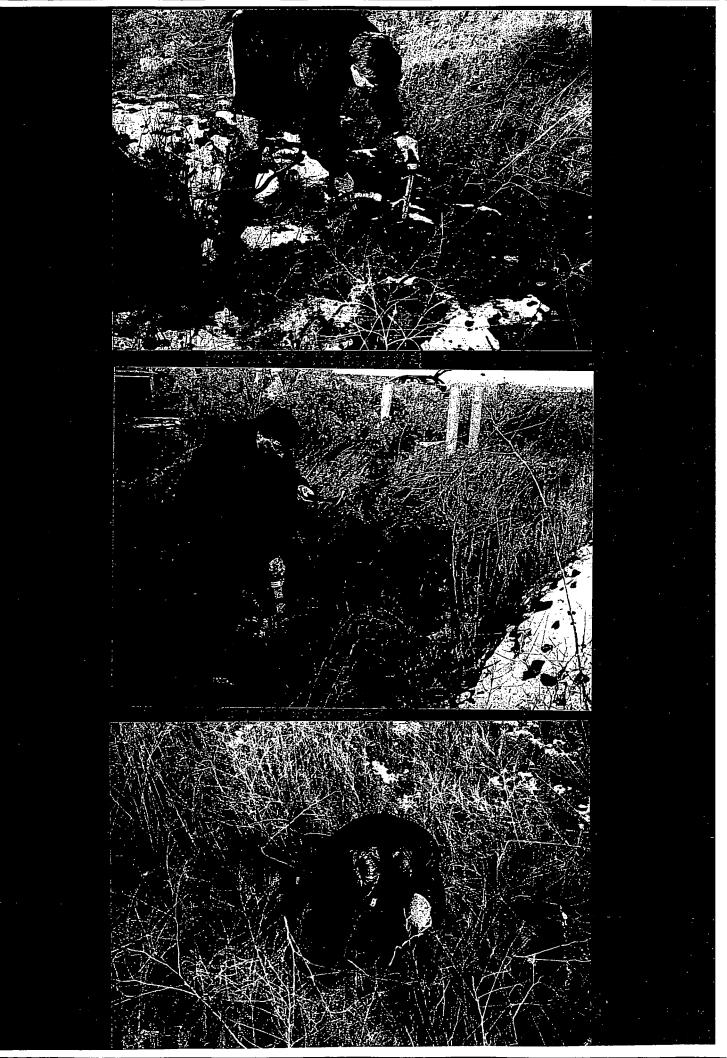
ROYAL CITY (BLYTHE), GRANT COUNTY, WASHINGTON

Missile Site Soil and Water Sampling Location Plan

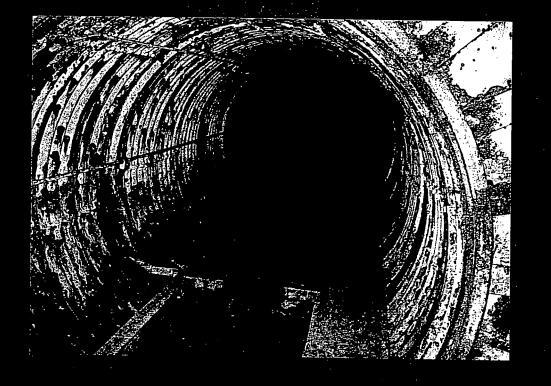


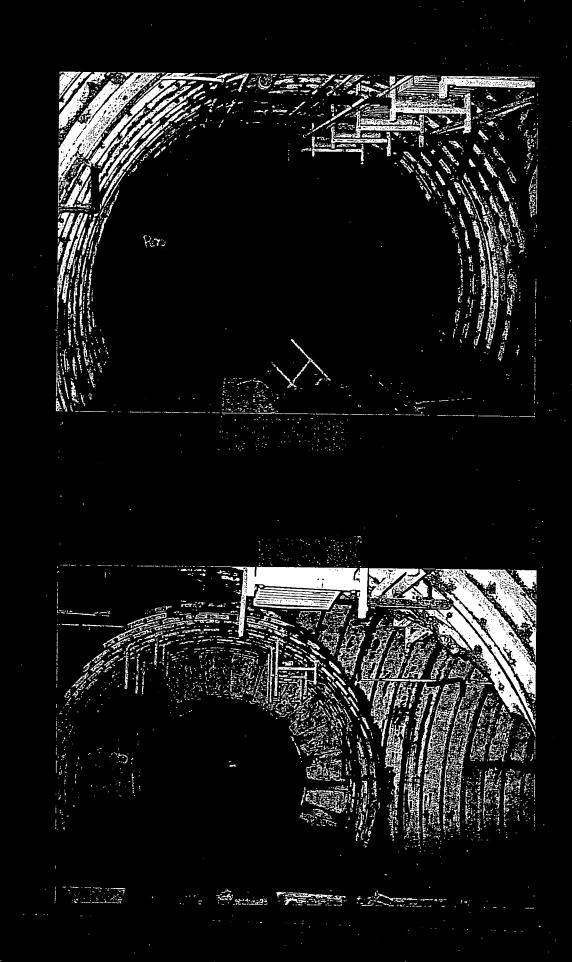


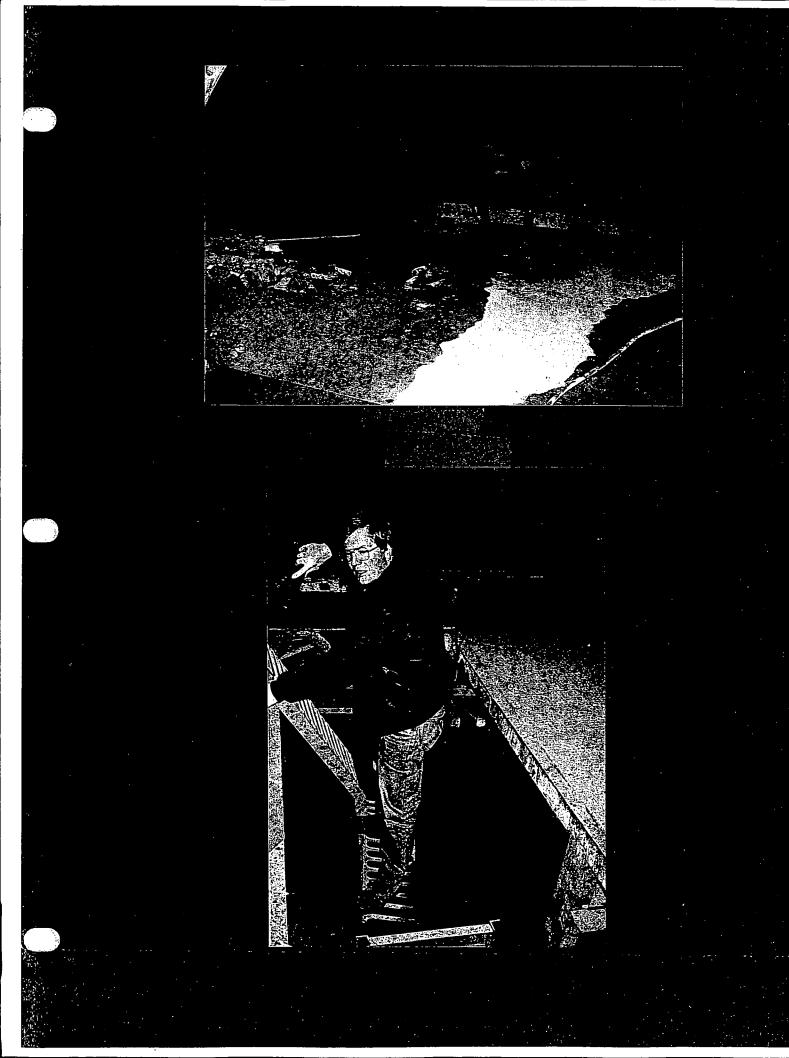












E. Site Access

Guy Barrett, FUDS Project Manager, contacted Mr. Bruce M. Moser on November 17, 1999 to make arrangements for site access. Mr. Ash stated that the Department of Ecology was granted access to the Formerly Used Defense Site Larson AFB Titan Missile Facility S-3 for the purpose of performing an initial investigation. Mr. Ash's telephone number is (253) 481-1300. In addition, Ecology contacted B&G Farms on November 17, 1999 and was granted permission to investigate this site. B&G Farms' telephone number is (509) 346-2294.

FINDINGS REGARDING THE POTENTIAL PRESENCE OF HAZARDOUS MATERIALS AT OTHELLO (ROYAL CITY) ICBM SITE

One purpose of the DERA investigations is to investigate the possibility that formerly owned or formerly occupied DOD properties such as the property that is the subject of this report, may have residual hazardous materials contamination that could be attributed to former DOD property uses. Hazardous materials contamination resulting from activities on the property prior to or after DOD use is not the subject of this report and was not investigated.

The site of the former Othello (Royal City) ICBM facility was surveyed on May 28, 1986. An on-site interview with the current property caretaker, a visual inspection of the aboveground features of the site, plus a review of existing agency documents relating to the site were used to formulate this report. While under DOD control, a number of hazardous materials was used to support facility activities including large quantities of fuel oil and liquid oxygen and smaller quantities of compressed nitrogen, ethylene glycol, and miscellaneous industrial cleaners and solvents. No verbal or visual indication of hazardous materials contamination was obtained during the on-site visit. However, a review of a report written by U.S. EPA's Technical Assistance Team (TAT) after an inspection and sampling of the site in September, 1984 indicated some potential problems but most, if not all, may be due to post-DOD ownership activities. During facility operation, two 500-ft wells in the powerhouse structure were used to supply process water. If hazardous materials spills occurred in the powerhouse, the wells could have provided a conduit to groundwater contamination. During salvage operations the well casings were cut off level with the floor. The TAT observed a small quantity of water with possible contaminants draining down the uncapped wells, but sampling data from this well indicated no significant presence of contaminants. The presence of several feet of water in some of the complex was also observed. This standing water had a visual oil sheen in some locations according to the TAT report.

Based on the above information, it is recommended that both existing facility groundwater wells be sampled, if they are not debris-filled. In addition, the large storage tanks should be sampled to determine if they contain hazardous materials that could be attributed to DOD use. Standing water where a sheen is apparent may also require sampling.



DEPARTMENT OF THE ARMY SEATTLE DISTRICT, CORPS OF ENGINEERS P.O. BOX 3755

SEATTLE, WASHINGTON 98124-2255

SEP 3₀ 1992

CENPS-EN-GT-HW (200-1a)

MEMORANDUM FOR Commander, U.S. Army Engineer Division, North Pacific, ATTN: CENPD-PM-MP, P.O. BOX 2870, Portland, Oregon 97208-2870

SUBJECT: Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS) Inventory Project Report (INPR) for Site No. F10WA035100, Larson AFB Titan Missile Facility S-3, Royal City, Grant County, Washington

- 1. The enclosed INPR presents the DERP-FUDS Preliminary Assessment (PA) for the above former missile facility. Site visits were conducted in May 1986 and June 1991. The site survey summary sheet and site map are included in the INPR.
- 2. We have determined that the site was formerly used by the Air Force. A recommended "Findings and Determination of Eligibility" is included in the INPR.
- 3. Also, we have determined there is a potential for an environmental release of hazardous waste at the site which would be eligible for further evaluation and/or cleanup under DERP-FUDS. The category of waste is hazardous waste (HTW). A project summary sheet is included in the INPR.
- 4. A copy of this INPR is being forwarded to CEMRD for concurrent technical review.
- 5. We recommend:
 - a. Approving and signing the FDE;
 - b. Forwarding a copy of this INPR to CEHND for the PA file;
- c. Forwarding a copy of this INPR to CEMP requesting approval and funding for this district to perform a limited remedial investigation. A schedule and cost estimate are included in the INPR.

Encl

WALRER J. CUNNINGHAM

Colonel, Corps of Engineers

Commanding

SITE SURVEY SUMMARY SHEET FOR

DERP-FUDS SITE NO. F10WA035100 LARSON AFB TITAN MISSILE FACILITY S-3, ROYAL CITY SEPTEMBER 1992

SITE NAME: Larson AFB Titan Missile Facility S-3 (Royal City).

LOCATION: The site is approximately 27 miles northwest of Othello, Grant County, Washington; see site map attached.

SITE HISTORY: This site was used by the Air Force between 1962 and 1966 as a Titan I ICBM facility. Aboveground structures consisted of a gatehouse, entry portal, air intake and exhaust structures, sewage stabilization pond, spray pond, and security fencing. Subterranean construction consisted of a "hard" launch facility, with three missile launch complexes, each with three vertical missile silos, propellant and equipment terminals, two radar antenna silos, air intake and exhaust structures, control center, powerhouse, access portal, and an interconnecting steel tunnel system. Two deep wells, one 800 feet and one 915 feet, supplied the water for the two 30,000 gallon underground water tanks which serviced the facility.

Various hazardous, flammable and/or explosive materials were used, stored and disposed of on-site during the period of operation of the facility. These included diesel oil, RP-1 fuel (kerosene), lubrication oil, hydraulic fluids, solvents, degreasers, transformer fluids (PCB's), nickel-cadmium batteries, liquid oxygen, nitrogen and helium. In most cases, these substances were held in tanks housed inside the facility or buried adjacent to it. Storage capacities indicate the following volumes of selected substances were present routinely at the site: 40,000 gallons of RP-1; 134,000 gallons of diesel oil; 24,500 gallons of liquid gas, 78,000 gallons of liquid oxygen; 3500 gallons of sulphuric acid, and nine clusters of high pressure tanks containing helium and nitrogen.

The Royal City site was declared excess in 1966, and an accelerated program of salvage by private contractors under the direction of the Air Force followed. Salvage operations were extensive and evidently rapid. Generators, electrical equipment and supplies, motors, fixtures and storage tanks were frequently removed in such operations. In 1967, (b) (6) purchased the property. ((b) (6) purchased the property. ((b) (6) purchased the property but has made no other use of it.

F10WA035100 - LARSON AFB TITAN MISSILE FACILITY S-3, ROYAL CITY

Overall, condition of the facility is poor and no post-DOD use has been made of it. During the Air Force's salvage operation, the two water wells in the powerhouse were cut off at floor level and left uncapped. Subsequent flooding of the facility has occurred allowing contamination to enter the groundwater through the uncapped wells which now serve as conduits from the powerhouse to the groundwater. The site inspection revealed standing water in parts of the facility, with a visible oil sheen. Also, it is unclear whether all underground fuel storage tanks (UST's) were removed from this facility.

In 1975, the local irrigation district abandoned a nearby well due to high iron bacteria content. Since it was thought that materials left in the missile facility might be the cause of the contamination, the Environmental Protection Agency (EPA) inspected the facility and took two composited samples from the standing water in the powerhouse. The analytical results revealed several heavy metals and one volatile organic were present in the water.

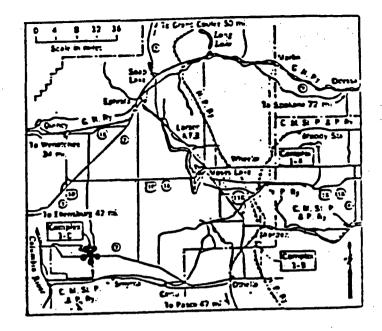
SITE VISIT: Initially, the site was visited on 28 May 86 by Robert S. Anderson of R.S. Anderson/Land Use Planning and Anton M. Fackelman of Tetra Tech, Inc., under contract to Seattle District. Jonathan Maas from the Corps of Engineers also participated. A follow-up inspection was conducted by Joan Shafer and Mike Svizzero (CENPS-EN-GT-HW) on 5 June 1991.

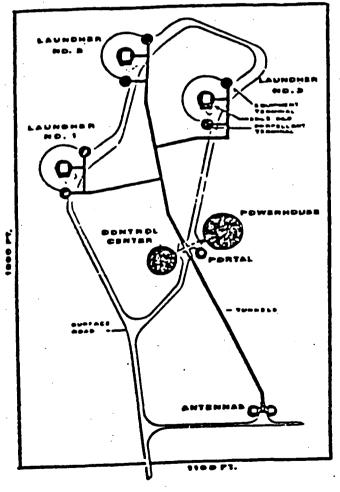
CATEGORY OF HAZARD: HTW.

PROJECT DESCRIPTION: A limited Remedial Investigation (RI) to confirm and characterize hazardous waste contamination at this site is proposed. There is known contamination by heavy metals and one organic compound. The RI is needed to determine the extent and level of this contamination, and to determine if any other contaminants, such as PCB's are present. Also, it will be determined if any UST's remain on the property.

AVAILABLE STUDIES AND REPORTS: Report of Excess Real Property.

SEATTLE DISTRICT POC: Jonathan A. Maas, CENPS-EN-GT-HW, (206) 764-6745.





VICINITY MAP

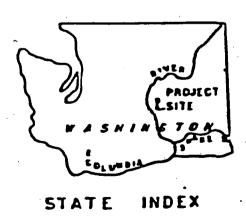


FIG. 1.—TYPICAL LAUNCH COMPLEX

F10WA035100 LARSON AFB AF TITAN MISSILE FACILITY S-3 ROYAL CITY (BLYTHE), GRANT COUNTY, WASHINGTON

DEFENSE ENVIRONMENTAL RESTORATION PROGRAM FOR FORMERLY USED DEFENSE SITES (DERP-FUDS) FINDINGS AND DETERMINATION OF ELIGIBILITY

LARSON AFB TITAN MISSILE FACILITY S-3, ROYAL CITY GRANT COUNTY, WASHINGTON SITE NO. F10WA035100

FINDINGS OF FACT

- 1. The property was acquired between 1959 and 1963 for the Department of the Air Force, Strategic Air Command, for a Titan Intercontinental Ballistic Missile (ICBM) launch site. A total of 313.74 acres was acquired as follows: 53.34 acres fee by negotiated purchase and 0.40 acres fee by condemnation, in 1959 and 1960; 1.84 acres perpetual easement by negotiated purchase in 1960; 1.84 acres temporary easement and right-of-way, covering the same area as above perpetual easement by negotiated purchase in 1960; one no-area license by donation in 1959; 255.53 acres perpetual restrictive easement by negotiated purchase in 1961-62; 2.63 acres perpetual easements by negotiated purchase in 1963; and one no-area use permit by temporary transfer in 1962.
- 2. The Air Force constructed a "hard" launch facility with an underground complex consisting of three missile launch complexes, each with three missile silos, propellant and equipment terminals, two radar antenna silos, air intake and exhaust structures, powerhouse, control center, access portal, and an interconnecting steel tunnel system.
- 3. The facility was declared excess in 1966. The General Services Administration (GSA) subsequently conveyed the 53.74 acres fee. 1.84 acres perpetual easement, and the no-area license to (b)(6) by quitclaim deed (QCD) executed 29 September 1967. ((b)(6) c) The QCD identifies the former use of the property (missile site) and contains a covenant whereby the grantees agree to indemnify and save harmless the USA against any and all claims arising out of its use of the property. GSA assumed custody and accountability for the 255.53 acres perpetual restrictive easement effective 8 January 1968. The 1.84 acre temporary easement and right-of-way terminated on 3 November 1961. GSA assumed custody and accountability for the 2.63 acres perpetual easement effective 28 September 1977 and is still holding them in their inactive

Larson AFB Titan Missile Facility S-3, Royal City

F10WA035100

inventory for disposal on a case by case basis. The no-area use permit was retransferred back to the owner effective 16 December 1974.

DETERMINATION

Based on the foregoing findings of fact, this site has been determined to be formerly used by the Department of Defense. It is therefore eligible for the Defense Environmental Restoration Program - Formerly Used Defense Sites, established under 10 USC 2701 et seq.

Date

ERNEST J. HARRELL Major General, USA Commanding

PROJECT SUMMARY SHEET FOR

DERP-FUDS HTW PROJECT NO. F10WA035101
LARSON AFB TITAN MISSILE FACILITY S-3, ROYAL CITY
GRANT COUNTY, WASHINGTON
SITE NO. F10WA035100
SEPTEMBER 1992

PROJECT DESCRIPTION. A Remedial Investigation (RI) to determine the extent and total character of contamination that exists as a result of past DOD activities is proposed for this site. The project consists of sampling and analysis of groundwater and soil to characterize the contamination, and a geophysical survey to determine if any underground storage tanks (USTs) remain on site from DOD activities.

NOTE: Persons entering the facility should be aware that the portal shaft is infested with pigeons. It is recommended that air filtration respirators be used due to the high concentration of airborne dried pigeon droppings.

PROJECT ELIGIBILITY. This facility was originally constructed for and used by the Air Force. Any remaining USTs have not been used by post-DOD owners, so are DOD's responsibility. In the event that hazardous wastes in excess of regulatory action levels are encountered, further work will be proposed.

POLICY CONSIDERATIONS. Current DOD policy permits investigation and remediation of hazardous and toxic waste generated by the DOD at formerly used defense facilities regardless of the current status of the site in question.

PROPOSED PROJECT. A limited Remedial Investigation (RI) to further characterize the contamination at the site is proposed. The project will consist of sampling and analysis of groundwater and soil including samples from each of the two groundwater wells, the standing water in the powerhouse, and the soils near the former spray pond and well houses. Also, a determination will be made as to whether any UST's remain on the property.

COST ESTIMATE: Attached.

EPA FORM 1290-12: Attached.

DISTRICT POC: Jonathan A. Maas, (206) 764-6745.

LARSON AFB TITAN MISSILE FACILITY S-3, ROYAL CITY REMEDIAL INVESTIGATION Proposed Schedule

Day #	
. 0	Receive WAD and funding
1	Task NPSEN-GT-G with Geophysical Investigation
5	Issue request for proposals to NPS indefinite delivery contractors
20	Receive contractor proposals
35	Complete negotiations
45	Award work orders
50	MIPR Laboratory Testing Funds to NPD Lab
59	Perform site visit
112	Contractor submits draft Work and Safety Plans
142	Corps provides comments on draft plans
163	Contractor submits final Work and Safety Plans
170	Corps approves plans
185	Initiate field work
275	NPD lab provides analytical results
335	Contractor submits draft report
375	Corps provides comments on draft report
405	Contractor submits final report
410	Project complete

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O. DESCRIPTION OF PROPOSED CONSTRUCTION

Perform a limited Remedial Investigation (RI) at a former missile launch facility, to include a geophysical survey to determine if any UST's remain on-site from DOD activities.

See attached description.

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JOAN ALBERG	COE	CENTS-EN-ET-S	(1) 1506136462 A2	9-18-92

LARSON AFB TITAN MISSILE FACILITY 5-3 ROYAL CITY L IDENTIFICATION POTENTIAL HAZARDOUS WASTE SITE **SEPA** BI STATE GOT SITE NUMBER Preliminary assessment PART 2-WASTE INFORMATION IL WASTE STATES, QUANTITIES, AND CHARACTERISTICS AT WATE CHARTERS COM PROP DI PHYSICAL STATES com a no mo 61 WASTE QUANTITY AT BITE MI MONEY WOLATES

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LARSON AFB TITAN MISSIE FACILITY 5-3 ROYAL CITY

SEPA

POTENTIAL HAZARDOUS WASTE SITE PRELIMINARY ASSESSMENT

L EDENTIFICATION

PART 1 - DESCRIPTION OF HAZARDOUS CONDITIONS AND DICIDENTS

& MAZARDOUS CONDITIONS AND INCIDENTS			
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	HEAVY METALS + C		
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Project No. or Name Larson 5-3
Element or Section No.
Revision No.
Revision Date
Section/Element Page of

Larson AFB Titan Missile Facility S-3 Royal City, WA

Quality Assurance Project Plan

Guy Barrett November 3, 1999

Washington State Department of Ecology Toxics Cleanup Program Site Cleanup and UST Section

Conducted for the Department of Ecology

Approvals:

Cliff Kirchmer Chy Kuchuse Stuart Magoon Stuart Magoon Quality Assurance Officer 11/16/99 Acting Lab Director, Manchester Laboratory

Guy Barrett Yay January Project Lead

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Element or Section No	
Revision No	
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Project Description

Historical Information/Site Description

The Larson AFB Titan Missile Facility S-3, located in Royal City, Washington was formerly used by the Air Force between 1962 and 1966 as a Titan intercontinental ballistic missile (ICBM) launch site (Figure 1). Aboveground structures consisted of a gatehouse, entry portal, air intake and exhaust structures, sewage stabilization pond, spray pond, and security fencing. Subterranean structures included a "hard" launch facility, with three missile launch complexes, each with three vertical missile silos, propellant and equipment terminals, two radar antennae silos, air intake and exhaust structures, control center, powerhouse, access portal, and an interconnecting steel tunnel system. Two deep wells, one 800 feet and one 915 feet, supplied the water for the two 30,000 gallon underground water tanks which serviced the facility.

Various hazardous, flammable and/or explosive materials were used, stored and disposed of onsite during the period of operation of the facility. These included diesel oil, RP-1 fuel (kerosene), lubrication oil, hydraulic fluid, solvents, de-greasers, transformer fluids (PCB's), nickel-cadmium batteries, liquid oxygen, nitrogen and helium. In most cases, these substances were held in tanks housed inside the facility or buried adjacent to it. Storage capacities indicate the following volumes of selected substances were present routinely at the site; 40,000 gallons of RP-1; 134,000 gallons of diesel oil; 24,500 gallons of liquid gas; 78,000 gallons of liquid oxygen; 3500 gallons of sulphuric acid, and nine clusters of high pressure tanks containing helium and nitrogen. While liquid oxygen, nitrogen and helium were potentially hazardous substances during the operation of the site, they are no longer stored at the site and are not a focus of this project. Some of the organic and inorganic substances formerly present at the site may still be present, such as PCBs and metals. It is known that solvents and degreasers were stored, used, and disposed at this facility. Analysis of contaminants at similar properties have revealed trichloroethylene, perchloroethylene, and toluene which may have been used as solvents and degreasers.

Chlorinated solvents may have been used in the missile and propellant silos, power house dome, and released into the sanitary drain system via sump pumping, and thereby possibly getting into the soil. Diesel fuel and kerosene used in the silos and power house were discharged to drain fields and ditch areas. Metals may exist at the site due to impurities in fuel, machinery, lead-based paint, or waste oils. PCB's may be present in paints (used for durability), transformers, and hydraulic fluid releases.

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The Royal City site was declared excess in 1966, and salvage operations were carried out under the direction of the Air Force followed by private contractors. Condition of the facility is poor and no post-DOD use has been made of it. During Air Force salvage operations, the two water supply wells in the powerhouse were cut off at floor level and left uncapped. Subsequent flooding of the facility has occurred, possibly allowing contamination to enter the groundwater through these wells. It is also not known whether all underground storage tanks were removed from this facility.

In 1975, the local irrigation district abandoned a nearby well due to high iron bacteria content. Since it was thought that materials left in the missile facility might be the cause of the contamination, the Environmental Protection Agency inspected the facility and took two composited samples from the standing water in the powerhouse. The analytical results revealed several heavy metals (cadmium, lead, thallium, zinc, chromium, and copper) and one semi-volatile organic (bis [2-ethyl hexyl] phthalate) were present in the water.

Ecology has not been notified of environmental concerns at this site, but based on investigative results from similar sites, an initial investigation is warranted. Ecology will contact the current owner of this property seeking access. A preliminary site visit will not be performed, rather on December 15, 1999 field investigation of this site will commence.

Objectives

The primary objective of this study is to investigate the possible presence of hazardous substances resulting from past practices by the Department of Defense. The investigation will be done to confirm the presence of heavy metals and the one semi-volatile organic, and to determine if any other contaminants, such as PCB's and total petroleum hydrocarbons (TPH), are present. Soil and water sampling will be conducted at the FUDS Larson AFB Titan Missile Facility S-3 to determine whether residual soil or water contamination is present above Washington State Model Toxics Control Act (MTCA) Cleanup Levels, Chapter 173-340 WAC. This investigation will be used to either confirm or deny the No Further Action (NoFA) required determination made by the Seattle District, Corps of Engineers.

Study Design

At specific locations on the property with the most likely potential for contamination to be present, shallow soil samples will be taken. Ecology anticipates that shallow soil samples will be obtained at the former power house (EPA previously found heavy metals, one volatile organic, and observed an apparent oil sheen), near the control center (UST may be present), and launcher drainfields (TCE may have been flushed from launchers) as these areas represent the most likely source of spills, leaks, and other release of hazardous materials into the environment. While in

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the field, if it appears necessary to investigate the subsurface, a hand auger or corer will be used to collect subsurface soil samples. Subsurface sampling may be done if the substance released is known to be mobile in the environment, if surface staining is present in permeable soils, if a release has collected in a topographically depressed area, or other factors are present which would indicate possible subsurface migration. This subsurface sampling will most likely be done in the launcher drain fields, since a 1999 investigation by Hart Crowser, Inc. for the U.S. Army Corps of Engineers at a similar site, Larson Titan S-1, found evidence of volatiles using a soil gas technique at various depths in that area of the site (Figure 2). Actual sample locations will be similar to those at Larson Titan S-1. Additional or different sampling locations may be selected during field work based on visual or other additional information. Soil samples will be collected and analyzed for volatile organics (specific compounds of interest are trichloroethylene, perchloroethylene, and toluene), total petroleum hydrocarbons (diesel and oil range), metals (priority pollutant metals), and PCB's. If sampling of power house standing water is accessible, Ecology will collect water samples and analyze these for metals, one semi-volatile, and TPH. If accessible, groundwater samples will be taken from each of the two onsite wells and analyzed for volatile organics, TPH and metals (lead, cadmium, thallium, zinc, chromium, and copper). After first obtaining permission to access the property from the current owner, samples will then be collected.

Schedule

This project is scheduled for approximately a four month period. Project milestones and projected dates of completion are listed below. At the end of four months, all data will be evaluated and summarized in a technical report. Any need for additional work will be evaluated at that time.

<u>Milestone</u>	<u>Date</u>
QAPP Approved	November 1999
Field Sampling	December 1999
Final Report	February 2000

Budget

The estimated laboratory budget for this project is \$3,215 based on analysis of ten soil samples (including one field duplicate) and eleven water samples (including one spike duplicate, one matrix spike).

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Laboratory Cost Estimate

Metals/ PCBs	Matrix (soil) *	# Samples 0	<u>Cost</u> \$294	Subtotal \$588
Metals	(water)	3	\$196	\$588
TPH	(soil)	3	\$112	\$336
	(water)	3	\$102	\$306
VOC's	(soil)	4	\$169	\$676
	(water)**	3	\$156	\$468
Semi- volatiles	(water)	1	\$253	\$253

Total \$3,215

Project Organization

The project will be organized with key personnel performing the following functions:

The project was requested by *Guy Barrett* of the Toxics Cleanup Program (HQ). He will be the project lead and will assist with project design, review of all documents, notification of all landowners of our activities, and preparation of a technical report summarizing any significant findings. His phone number is 360-407-7244.

Carol Johnston will be responsible for sample collection, data gathering and evaluation, and field reports. She can be reached at (360) 407-7242.

^{*} includes field duplicate

^{**} includes spike duplicate, matrix spike

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Karin Feddersen, Analytical Management Unit Leader, will assist as laboratory contact. Her phone number is (360) 871-8829.

Stuart Magoon, Acting Laboratory Director, will assist as laboratory contact. His phone number is (360) 871-8801.

Cliff Kirchmer, Quality Assurance Officer, assisted in review of QAPP and will assist on any quality assurance issues. His phone number is (360) 407-6455.

Data Quality Objectives

Precision, Bias, and Required Detection Limits

Data quality objectives are quantitative and qualitative statements specified to ensure that data of known and appropriate quality are obtained during the soil and water sampling activities to support the selection of appropriate remedial actions. This should be considered as a screening project and is being done so as to make an initial determination whether contaminants exist at this site. Field work, laboratory procedures, quality control objectives, and the results will then be used to either confirm or deny this objective. The data must be of sufficient quality to positively identify the chemicals of concern. An assessment of data quality is based upon quantitative (accuracy) and qualitative (comparability and representative) quality assurance objectives. Precision measures the reproducibility of measurements under a given set of conditions. For this project, the variability between the group of measurements will be noted. Bias is the difference between the analytical result and a reference or true value due to systematic error. Limited field blanks will be used as if they are ordinary samples. Results from these field blanks will cause rejection of associated actual sample data if over five times the actual sample result. The precision and bias routinely obtained with the methods selected will be adequate for the purposes of this project. The required detection limits (RDL) are generally specified as ten times lower than the MTCA Cleanup Levels (CULs), which are listed in the table on Page 8. The RDL is set lower than MTCA cleanup levels in order to achieve the precision necessary to make good decisions.

Representativeness

Representativeness measures how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the matrix sampled. This program will use the results

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of all analyses to evaluate the data in terms of its intended use. Site locations for sampling are placed using a non-random approach to maximize the likelihood of locating and identifying site contamination, if present.

Samples will be packed carefully to minimize the chance of damage or loss. In the event that a sample is damaged during transit or testing, a new sample will be collected and submitted for analysis. The laboratory should notify the project lead as soon as possible when a sample is unsuitable.

Accuracy.

Accuracy measures the closeness of the measured value to the true value. This measure is affected by precision (random error), bias (systematic error), and variability in the medium being sampled. Accuracy requirements are expressed as QC Limits in the table under the section titled "Analytical Procedures".

Metals - DQO of 10% max. bias, 5% max. Relative Standard Deviation (RSD) Volatile Organics - DQO of 25% max. bias, 35% max. RSD Diesel - DQO of 25% max. bias, 12.5% max. RSD PCBs - DQO of 25% max. bias, 30% max. RSD

Comparability

Soil sample results will be compared to cleanup levels established under the Model Toxics Control Act, (MTCA) Chapter 70.105D RCW as noted below in the section titled Analytical Procedures. Methods used at Manchester Laboratory for analyzing metals (EPA Method 6010), volatile organics (EPA Method 8260B), diesel (NWTPH-Dx), and PCBs (EPA Method 8082) are adequate to meet the data quality objectives for this study (Manchester Environmental Laboratory, 1994).

Sampling Procedures

A total of approximately 10 surface/near surface soil samples (1 metals/PCB, 3 NWTPH-Dx, 4 VOCs, 1 PCB, and 1 field duplicate) and 9 water samples (2 volatiles, 1 semivolatile, 3 metals, and 3 NWTPH-Dx) will be collected from at least six locations - the power house, UST locations, spray pond, outside well, antennae and launch areas. The launch areas will have three samples collected for TCE. The spray pond will have one sample collected for TCE and one for diesel contamination. Each of the two wells inside the powerhouse will have one sample taken

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for heavy metals, one for volatiles, and one for diesel. Standing water in the power house will have one sample collected for diesel, one for metals, and one for semi-volatiles. The soil next to the outside well house will be composite sampled once for PCBs/metals. Two suspected UST locations will each have one sample collected for diesel contamination. The two adjacent antennae locations will have one composite PCBs/metals sample collected. Additional locations may be identified in the field which may result in additional samples. Sample collection and analysis methods have been selected to provide data of sufficient quality for the above project objectives.

Surface soil grab samples will be collected directly by using precleaned stainless steel spoons. Stainless bowls will be used for compositing purposes. Surface soil samples will be first obtained from 0 to 2 inch depth, then these grab samples will be placed directly in pre-cleaned jars from the Manchester Laboratory. On at least two occasions, soil samples will be composited prior to placement in the pre-cleaned jars. All sampling equipment which is not disposable or dedicated will be decontaminated by scrubbing with an Alconox solution and rinsing with distilled, deionized water prior to reuse. Subsurface soil samples will be obtained at depths between 0.0 to 1.5 feet using a 2-inch diameter stainless steel hand auger or coring device. Upon sample collection and proper labeling, all samples will be stored in an ice-filled cooler. Chain-of-custody procedures will be followed according to Manchester Environmental Laboratory protocol (Ecology, 1994).

Approximately 9 well and standing water samples (3 TPH-Dx, 3 VOC's, 3 metals) will be obtained by dedicated disposable bailers or directly from the faucet in the case of the drinking water well. A trip blank consisting of organic-free distilled, deionized water in a sealed 40 ml vial prepared by Manchester Laboratory, will accompany all water samples designated for volatiles analysis.

Samples will be transported to the Ecology headquarters building in Lacey. Samples will be kept in the walk-in cooler until picked up by the laboratory courier to Ecology/EPA Manchester Environmental Laboratory in Manchester, Washington.

Analytical Procedures

Soil samples will be analyzed for total petroleum hydrocarbons using NWTPH-Dx. Metals will be analyzed using ICP-AES, ICP-MS, furnace AA, and cold vapor AA methods for Priority Pollutant Metals, specifically looking for cadmium, lead, thallium, zinc, chromium, and copper which were found during a previous investigation. Several analytical techniques are being used for metals because of specific needs for different metals and matrices. Semi-volatiles will be analyzed using EPA Method 8270. PCB's will be analyzed using EPA Method 8082. Low detection limits obtained with these analytical methods are necessary for this project to meet Model Toxics Control Act (MTCA) requirements. Procedures are specified with the method

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numbers for instrumental methods only, and appropriate sample preparation procedures will be chosen by the lab.

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Revision No	
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Compound	Matrix	MTCA CUL	QC	RDL	Method Reference
		•	<u>Limits</u>		<u> </u>
PCBs	soil	1.0 mg/kg	1	40 ug/kg	EPA Method 8082
	ļ		150%	· · · · · · · · · · · · · · · · · · ·	
DD Matala	soil	10 20 mg/kg	90	0.2 mg/kg	EPA Method 7060A
PP Metals	SUII	As - 20 mg/kg	120%*	0.3 mg/kg	EFA Welliod 7000A
	 	Ni - 1600		1.5 mg/kg	EPA Method 6010B
		mg/kg	120%*		
	<u> </u>	Cd - 2.0 mg/kg	80-	0.5 mg/kg	EPA Method 6010B
,			120%*		
		Pb - 250 mg/kg		3.0 mg/kg	EPA Method 6010B
			120%*		<u> </u>
	ļ	D- 0.022		0.4 //	EDA Mark ad COAOD
		Be -0.233 mg/kg	i	0.1 mg/kg	EPA Method 6010B
		Cr -100 mg/kg		0.5 mg/kg	EPA Method 6010B
	-	Cu -2960		1.0 mg/kg	EPA Method 6010B
	ļ	mg/kg		i i o mg/kg	
	 	Hg - 1.0 mg/kg	<u> </u>	.05 mg/kg	EPA Method 7470A
		Se -400 mg/kg		0.5 mg/kg	EPA Method 7740
		Ag -400 mg/kg		0.3 mg/kg	EPA Method 6010B
		TI -5.6 mg/kg		0.3 mg/kg	EPA Method 7841
		Zn - 24000		0.4 mg/kg	EPA Method 6010B
		mg/kg		···	
		·		:	
	water	Pb - 5.0 ug/L	75-	0.2 ug/L	EPA Method 7421
	VI GIO	1 2 0.0 ag. 2	125%*	o ug,_	2.7.11104.104.7.12.1
		Bis(2-	·	10-50 ug/L	EPA Method 8260B
		ethylhexyl)phth			
		alate			
		diesel		.25 mg/L	NWTPH-Dx
TPH	soil	200 mg/kg	**50-	diesel - 25	NWTPH-Dx
••••		· · · · · · · · · · · · ·	i	mg/kg	
				oil - 100	NWTPH-Dx
·			150%	mg/kg	

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Element or Section No.	
Revision No	
Revision Date	
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				-	
Semi-vols	soil	500 ug/kg	70- 130%*	50-100 ug/kg	EPA Method 8270
·	water	5.0 ug/L	70- 130%*	10-50 ug/L	
Volatiles (TCE,PCE, toluene)	soil	0.5 mg/kg		5-20 ug/kg	EPA Method 8260B
	water	5.0 ug/L		1-10 ug/L	EPA Method 8260B

^{*} Recovery for LCS

Quality Control Procedures

Field

Field quality control samples will consist of a field duplicate for each of the sampled matrices. A duplicate soil sample will be collected by obtaining a surface soil sample as close as possible to one of the sample locations. One field duplicate sample will be collected for every 10 soil samples.

These samples will be submitted to the laboratory with a different identification. The purpose of the samples is to estimate total variability in the results.

Laboratory

Routine laboratory quality control procedures will be adequate to estimate laboratory precision and bias for this project. Laboratory quality control tests consist of blanks, replicates, matrix spikes and check standards, which are done on each set of 20 or fewer samples.

Precision will be estimated from the results of replicate analyses of check standards, matrix spikes and field duplicate samples. Results of analyses of check standards and matrix spikes will be used as indicators of bias due to calibration or matrix effects, respectively. Analytical duplicates and matrix spikes should be prepared from these samples.

^{**} Recovery for Surrogate

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Data Reduction, Review and Reporting

Laboratory

All laboratory data generated by Manchester Environmental Laboratory will be managed by the Laboratory Information Management System (LIMS) and reported in electronic format (ASCII) files to the project lead. Laboratory data generated at contract laboratories will undergo a quality assurance review by Manchester Laboratory staff. Contract laboratory data will be transmitted to the project lead in paper format.

Project

A technical report will be prepared at the completion of all sampling summarizing any significant findings.

References

Manchester Environmental Laboratory, 1994. Lab User's Manual. Washington State Department of Ecology, Revised January 1994.

Toxics Investigations Section, 1994. Quality Assurance Project Plan Guidance. Washington State Department of Ecology, Environmental Investigations and Laboratory Services Program, October 1994.

Quality Assurance Section, 1991. Guidelines and Specifications for Preparing Quality Assurance Project Plans. Environmental Investigations and Laboratory Services Program, May 1991.

Larson AFB Titan Missile Facility S-3 Inventory Project Report (INPR), Department of the Army, September, 1992.

TAT Activities Report, Preliminary Site Assessments Abandoned Missile Silos, Blythe (Grant County), Washington, Region X Technical Assistance Team, September 1984.

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

December 17, 1999

Subject:

FUDS Larson S-3 Project

Sample(s):

99498080 and 99498087

Officer(s):

Guy Barrett

By:

Bob Carrell

Organics Analysis Unit

NWTPH-Dx ANALYSES

ANALYTICAL METHODS:

These samples were extracted following Manchester Laboratory's standard operating procedure for the extraction of water and soil samples for analysis using the NWTPH-Dx method.

All analytes have a respective practical quantitation limit (PQL) that is higher than the corresponding method detection limit (MDL). If a petroleum product is detected and its identification is unambiguously confirmed at a concentration below its PQL, the reported concentration is qualified as an estimate using the "J" qualifier.

HOLDING TIMES:

All samples were extracted and analyzed within the method holding times.

BLANKS:

No petroleum products were detected at or above the practical quantitation limits (PQL) for this method, thus demonstrating that the system was free from contamination.

SURROGATES:

The pentacosane surrogate recoveries were acceptable, ranging from 62% to 146%, except for one of the water method blanks (OBW9348A1) which had a recovery of 49%. No qualifiers were added due to surrogate recoveries.

COMMENTS:

The data is useable as qualified.

DATA QUALIFIER CODES

U	-	The analyte was not detected at or above the reported result.
J	-	The analyte was positively identified. The associated numerical result is an <u>estimate</u> .
UJ	-	The analyte was not detected at or above the reported estimated result.
REJ	-	The data are unusable for all purposes.
NAF	_ 3	Not analyzed for.
N	-	For organic analytes there is evidence the analyte is present in this sample.
NJ	-	There is evidence that the analyte is present. The associated numerical Result is an estimate.
NC	-	Not Calculated
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498087

Date Collected: 12/09/99

Method: NWTPH-DX

Field ID: LARS3A01SED

Date Prepared: 12/13/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/15/99

Units: mg/Kg dw

Result Qualifier Analyte 4.2 #2 Diesel U

Surrogate Recoveries

146 Pentacosane

Authorized By:

Release Date: 12-17-99

Page:

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498087 (Duplicate - LDP1) Date Collected: 12/09/99

Method: NWTPH-DX

Field ID: LARS3A01SED

Date Prepared: 12/13/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/15/99

Units:

mg/Kg dw.

Analyte

Result Qualifier

#2 Diesel

4.1

U

Surrogate Recoveries

104 Pentacosane

Authorized By: Banelf

Release Date: $\sqrt{2} - \sqrt{7} - 99$

Page:

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9347A1 QC Type: Laboratory Method Blank

Project Officer: Guy Barrett

Method: NWTPH-DX Date Prepared: 12/13/99 Matrix: Sediment/Soil

Date Analyzed: 12/15/99

Units: mg/Kg dw

Analyte	Result Qualifier
#2 Diesel	4.1 U
l "	•

Surrogate Recoveries

124 % Pentacosane

Carel Authorized By:

Release Date: /2-/7-99

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9347A2

Method: NWTPH-DX

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Prepared: 12/13/99 Date Analyzed: 12/15/99

Units:

Matrix: Sediment/Soil mg/Kg dw

Analyte

Result Qualifier

#2 Diesel

4.1

100

U

Surrogate Recoveries

Pentacosane

Bance Authorized By:

Release Date: /2 -/ >

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Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498080

Method: NWTPH-DX

Field ID: LARSS3A01

Date Collected: 12/09/99

Date Prepared: 12/14/99

Matrix: Water

Project Officer: Guy Barrett

Date Analyzed: 12/15/99

Units: mg/L

Result Qualifier Analyte 0.033 #2 Diesel U

Surrogate Recoveries

62 % Pentacosane

Authorized By: Bankly

Release Date: 12-17-99

Page:

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBW9348A1

Method: NWTPH-DX

QC Type: Laboratory Method Blank

Matrix: Water

Project Officer: Guy Barrett

Date Prepared: 12/14/99 Date Analyzed: 12/15/99

Units: mg/L

Analyte : Result Qualifier

#2 Diesel

U

0.031

Surrogate Recoveries

Pentacosane 49 %

Authorized By: Bankl

Release Date: /2-/>-99

Page:

Department of Ecology

Analysis Report for

Semi-volatile petroleum products

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBW9348A2

Date Prepared: 12/14/99

Method: NWTPH-DX Matrix: Water

OC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Analyzed: 12/15/99

Units: mg/L

Analyte :

Result Qualifier

#2 Diesel

0.031

76

U

Surrogate Recoveries

Pentacosane

Authorized By:

Release Date:

Page:

7411 Beach Drive E, Port Orchard Washington 98366

January 6, 2000

Subject:

FUDS Larson S-3

Samples:

99498083 through 99498085

Project ID:

3113-99

Project Officer:

Guy Barrett

By:

Karin Feddersen 16

VOLATILE ORGANIC ANALYSIS

SUMMARY:

The data is usable with the qualifications noted.

ANALYTICAL METHODS:

Volatile organic compounds were analyzed using the Manchester Laboratory modification of the EPA Method 8260 purge-trap procedure and capillary Gas Chromatography with Mass Spectrometer (GC/MS) analysis. Routine QA/QC procedures were performed.

BLANKS:

A small amount of Toluene and Chloroform were detected in the laboratory blank. These target analytes were not detected in the sample.

SURROGATES:

Surrogate recoveries were within acceptable limits for all samples.

HOLDING TIMES:

Due to a series of instrument malfunctions, the samples were first analyzed on the last day of the recommended holding time of 14 days from collection. No analytes were detected in the samples, however, the instrument malfunctioned again and basic quality control was not met. The samples were analyzed again, and still had no detected analytes.

The instrument is now functioning properly. Since the samples were properly preserved, and were kept at the proper temperature, no qualification of the data was warranted for this condition.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Aliquots of sample 99498083 were spiked with target analytes to evaluate recoveries in the samples. Matrix spike recoveries were within acceptable limits with several exceptions.

Recoveries in one of the spikes were low for some of the gases and ketones. These analytes do not tend to purge well in soil. The results for these analytes have been qualified in the corresponding sample. Analytes with recoveries below 50% have been qualified with "UJ". Analytes with recoveries below 10% have been qualified with "REJ". Only Methylene Chloride was detected in the samples. The recovery for this analyte was acceptable in the first spike. This analyte has therefore not been qualified in the samples.

The internal standard recoveries were low in the other spike (matrix spike duplicate). The on-column analyte areas were similar to the first spike. This caused the spike levels to appear higher than they actually were. This condition is most likely due to a malfunction in the auto dispensing of the internal standard, rather than a result of interference due to the sample matrix.

DATA QUALIFIER CODES:

U - The analyte was not	detected at or above the re	ported value.
-------------------------	-----------------------------	---------------

J - The analyte was positively identified. The associated numerical value is an estimate.

UJ - The analyte was not detected at or above the reported estimated result.

REJ - The data are unusable for all purposes.

NAF - Not analyzed for.

N - There is evidence the analyte is present in the sample.

NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.

E - This qualifier is used when the concentration of the associated value exceeds the known calibration range. The associated numerical result is an estimate.

bold - The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

FUDS Larson S-3_9949.doc

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498083

Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3B01

2000 0011000000 12/05/55

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99 U

Units: ug/Kg dw

Ana	alyte	Result	Qualifier	Analyte	Result	Qualifier
Dic	hlorodifluoromethane	5	UJ	Tetrachloroethene	5	U
	oromethane	5 5 5	Ü	Dibromochloromethane	5	Ŭ
	yl Chloride	5	U	1,2-Dibromoethane (EDB)	5	U.
	momethane	5	UJ	Chlorobenzene	5	U
	oroethane	5	U	1,1,1,2-Tetrachloroethane	5	U
Tric	chlorofluoromethane	5	U	Ethylbenzene	5	U
Ethy	yl Ether	5	U	m & p-Xylene	10	U
	2 Trichlorotrifluoroethane	5	U	o-Xylene	5	U
1,1-	Dichloroethene	5 .	U	Styrene	5	U
	tone	10	U	Bromoform	5	U
Met	hyl Iodide		REJ	Isopropylbenzene (Cumene)	- 5	U
	bon Disulfide	10	U	1,1,2,2-Tetrachloroethane	20	U
Met	thylene Chloride	16		Trans-1,4-Dichloro-2-butene		REJ
Met	hyl t-butyl ether	5	U	1,2,3-Trichloropropane	5	U
Tran	ns-1,2-Dichloroethene	5	U	Bromobenzene	5	U
1,1-	Dichloroethane	5	U	n-Propylbenzene	5	U
2-Bt	utanone	5	U	2-Chlorotoluene	5	U
	1,2-Dichloroethene	5	U	1,3,5-Trimethylbenzene	5 5 5 5	U
2,2-	Dichloropropane	5	U	4-Chlorotoluene		Ŭ
	mochloromethane	5	U	Tert-Butylbenzene	5	U
	oroform	5 5	U	1,2,4-Trimethylbenzene	5 5 5 5	U
	ahydrofuran		U	Pentachloroethane	-5	U
1,1,	1-Trichloroethane	5	U	Sec-Butylbenzene	5	U
1,1-	Dichloropropene	5	U	p-Isopropyltoluene	5	U
	oon Tetrachloride	5	U	1,3-Dichlorobenzene	5	U
	Dichloroethane	5	U	1,4-Dichlorobenzene	5	U
Benz		5	U	n-Butylbenzene	5 5	U
	hloroethene	5	U	1,2-Dichlorobenzene		U
	Dichloropropane	5	U	Hexachloroethane	5	U
	romomethane	5	U	1,2-Dibromo-3-Chloropropane	5 5 5 5	U
	nodichloromethane	5	U	1,2,4-Trichlorobenzene	5	U
	1,3-Dichloropropene	5.3	U	Hexachlorobutadiene	5	UJ
	ethyl-2-Pentanone	10	U	Naphthalene	5	U
Tolu		5	U	1,2,3-Trichlorobenzene	5 ·	U
Tran	ns-1,3-Dichloropropene	4.7	U			
$ 1,1,1\rangle$	2-Trichloroethane	5	U			
	Dichloropropane	5	U			
₩Z-He	exanone		REJ			
i				•		

Authorized	Bv:	The E

Release Date:

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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498083

Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3B01

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units:

ug/Kg dw

Surrogate Recoveries

1,2-Dichloroethane-D4	113	%
1,4-Difluorobenzene	97	%
Toluene-D8	104	%
p-Bromofluorobenzene	93	%
1,2-Dichlorobenzene-D4	106	%

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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498083 (Matrix Spike - LMX1) Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3B01

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units: % Recovery

	Analyte	Result	Qualifier	Analyte	Result	Qualifier
	Dichlorodifluoromethane	38		Tetrachloroethene	95	
	Chloromethane	84		Dibromochloromethane	106	
	Vinyl Chloride	90		1,2-Dibromoethane (EDB)	106	
	Bromomethane	29		Chlorobenzene	95	•
	Chloroethane	91		1,1,1,2-Tetrachloroethane	101	
	Trichlorofluoromethane	88		Ethylbenzene	91	
٠	Ethyl Ether	123		m & p-Xylene	90	
	1,1,2 Trichlorotrifluoroethane	104		o-Xylene	90	
	1,1-Dichloroethene	100		Styrene	80	
	Acetone	102	•	Bromoform	106	
	Methyl Iodide	4		Isopropylbenzene (Cumene)	95	
	Carbon Disulfide	86		1,1,2,2-Tetrachloroethane	110	
E	Methylene Chloride	72		Trans-1,4-Dichloro-2-butene	0	
٦	Methyl t-butyl ether	122		1,2,3-Trichloropropane	133	
١	Trans-1,2-Dichloroethene	98		Bromobenzene	101	•
	1,1-Dichloroethane	104		n-Propylbenzene	51	
i	2-Butanone	100		2-Chlorotoluene	88	
ı	Cis-1,2-Dichloroethene	90		1,3,5-Trimethylbenzene	90	
ı	2,2-Dichloropropane	101		4-Chlorotoluene	94	
1	Bromochloromethane	125		Tert-Butylbenzene	87	
١	Chloroform	109		1,2,4-Trimethylbenzene	91	
١	Tetrahydrofuran	187		Pentachloroethane	119	·
1	1,1,1-Trichloroethane	104		Sec-Butylbenzene	80	
ı	1,1-Dichloropropene	93		p-Isopropyltoluene	74	
ı	Carbon Tetrachloride	103		1,3-Dichlorobenzene	88	
1	1,2-Dichloroethane	124		1,4-Dichlorobenzene	85	
1	Benzene	99		n-Butylbenzene	63	
Ì	Trichloroethene	101		1,2-Dichlorobenzene	89	
ı	1,2-Dichloropropane	101		Hexachloroethane	60	
١	Dibromomethane	127		1,2-Dibromo-3-Chloropropane	119	
	Bromodichloromethane	106		1,2,4-Trichlorobenzene	66	_
ĺ	Cis-1,3-Dichloropropene	59		Hexachlorobutadiene	40	•
1	4-Methyl-2-Pentanone	54		Naphthalene	71	
ľ	Toluene	99		1,2,3-Trichlorobenzene	<i>5</i> 5	
	Trans-1,3-Dichloropropene	67				
1	1,1,2-Trichloroethane	124				
J	1,3-Dichloropropane	115				
◀	2 -Hexanone	0				

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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498083 (Matrix Spike - LMX1) Date Collected: 12/09/99 Field ID: LARSS3B01

Method: SW8260

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units:

% Recovery

Surrogate Recoveries

1,2-Dichloroethane-D4	127	%
1,4-Difluorobenzene	107	$\overset{\sim}{\mathscr{H}}$
Toluene-D8	98	%
p-Bromofluorobenzene	97	%
1,2-Dichlorobenzene-D4	97	%

Authorized	By:	T.F

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498083 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3B01

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units: % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	114		Tetrachloroethene	120	
Chloromethane	130		Dibromochloromethane	112	
Vinyl Chloride	152		1,2-Dibromoethane (EDB)	114	
Bromomethane	40		Chlorobenzene	103	
Chloroethane	140		1,1,1,2-Tetrachloroethane	103	
Trichlorofluoromethane	159		Ethylbenzene	109	
Ethyl Ether	172	•	m & p-Xylene	99	
1,1,2 Trichlorotrifluoroethane	168		o-Xylene	94	
1,1-Dichloroethene	171		Styrene	76	
Acetone	102		Bromoform	85	
Methyl Iodide	3		Isopropylbenzene (Cumene)	96	
Carbon Disulfide	147		1,1,2,2-Tetrachloroethane	9 1	
Methylene Chloride	172		Trans-1,4-Dichloro-2-butene	o o	
Methyl t-butyl ether	162		1,2,3-Trichloropropane	108	
Trans-1,2-Dichloroethene	146	•	Bromobenzene	78	
1,1-Dichloroethane	152		n-Propylbenzene	48	
2-Butanone	94		2-Chlorotoluene	79	
Cis-1,2-Dichloroethene	135		1,3,5-Trimethylbenzene	80	
2,2-Dichloropropane	160		4-Chlorotoluene	75	
Bromochloromethane	161		Tert-Butylbenzene	82	
Chloroform	155		1,2,4-Trimethylbenzene	73	
Tetrahydrofuran	186	•	Pentachloroethane	77	
1,1,1-Trichloroethane	147	•	Sec-Butylbenzene	· 76	
1,1-Dichloropropene	140		p-Isopropyltoluene	63	
Carbon Tetrachloride	151		1,3-Dichlorobenzene	61	,
1,2-Dichloroethane	163		1,4-Dichlorobenzene	60	
Benzene	142		n-Butylbenzene	47	
Trichloroethene	148		1,2-Dichlorobenzene	53	
1,2-Dichloropropane	140		Hexachloroethane	46	
Dibromomethane	156		1,2-Dibromo-3-Chloropropane	7 9	
Bromodichloromethane	137		1,2,4-Trichlorobenzene	41	
Cis-1,3-Dichloropropene	64		Hexachlorobutadiene	28	
4-Methyl-2-Pentanone	44	•	Naphthalene	52	
Toluene	124		1,2,3-Trichlorobenzene	35 35	
Trans-1,3-Dichloropropene	63		1,2,5-11 lettlet enemette	33	
1,1,2-Trichloroethane	133				
1,3-Dichloropropane	126				
2-Hexanone	0				•
2-Hexanune	U				

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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498083 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3B01

Matrix:

Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units:

% Recovery

Surrogate Recoveries

1,2-Dichloroethane-D4	117	%
1,4-Difluorobenzene	97	%
Toluene-D8	89	%
p-Bromofluorobenzene	92	%
1,2-Dichlorobenzene-D4	106	%

Authorized By:	Kt
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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498084 Date Collected: 12/09/99 Method: SW8260

Field ID: LARSS3C01

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Matrix: Sediment/Soil
Units: ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	5.1	· U	Tetrachloroethene	5.1	U
Chloromethane	5.1	Ŭ	Dibromochloromethane	5.1	Ū
Vinyl Chloride	5.1	Ū	1,2-Dibromoethane (EDB)	5.1	Ŭ
Bromomethane	5.1	Ū	Chlorobenzene	5.1	Ŭ
Chloroethane	5.1	Ū	1,1,1,2-Tetrachloroethane	5.1	Ū
Trichlorofluoromethane	5.1	U	Ethylbenzene	5.1	Ū
Ethyl Ether	5.1	Ü	m & p-Xylene	10	Ŭ
1,1,2 Trichlorotrifluoroethane	5.1	Ŭ	o-Xylene	5.1	Ŭ
1,1-Dichloroethene	5.1	Ū	Styrene	5.1	Ŭ
Acetone	10	Ü	Bromoform	5.1	Ŭ
Methyl Iodide	5.1	Ū	Isopropylbenzene (Cumene)	5.1	Ŭ
Carbon Disulfide	10	Ŭ.	1,1,2,2-Tetrachloroethane	20	Ŭ
Methylene Chloride	42	f E	Trans-1,4-Dichloro-2-butene	5.1	Ŭ
Methyl t-butyl ether	5.1	$\overline{\mathbf{U}}$	1,2,3-Trichloropropane	5.1	Ü
Trans-1,2-Dichloroethene	5.1	Ŭ	Bromobenzene	5.1	Ū
1,1-Dichloroethane	_	Ū	n-Propylbenzene	5.1	Ŭ
2-Butanone	5.1	Ū	2-Chlorotoluene	5.1	Ŭ
Cia 1 2 Dichloroethana	5.1	Ū	1,3,5-Trimethylbenzene	5.1	Ŭ .
2,2-Dichloropropane	5.1	Ū	4-Chlorotoluene	5.1	Ŭ
Bromochloromethane	5.1	U	Tert-Butylbenzene	5.1	Ū
Chloroform	5.1	U	1,2,4-Trimethylbenzene	5.1	Ū
Tetrahydrofuran	5.1	U	Pentachloroethane	5.1	$ar{\mathbf{U}}$
1,1,1-Trichloroethane	5.1	U	Sec-Butylbenzene	5.1	Ū
1,1-Dichloropropene	5.1	U	p-Isopropyltoluene	5.1	Ü
Carbon Tetrachloride	5.1	${f U}$	1,3-Dichlorobenzene	5.1	U
1,2-Dichloroethane	5.1	U	1,4-Dichlorobenzene	5.1	U
Benzene	5.1	U	n-Butylbenzene	5.1	U
Trichloroethene	5.1	U	1,2-Dichlorobenzene	5.1	U
1,2-Dichloropropane	5.1	U	Hexachloroethane	5.1	U
Dibromomethane	5.1	·U	1,2-Dibromo-3-Chloropropane	5.1	U
Bromodichloromethane	5.1	U	1,2,4-Trichlorobenzene	5.1	U
Cis-1,3-Dichloropropene	5.4	U	Hexachlorobutadiene	5.1	U
4-Methyl-2-Pentanone	10	${f U}$	Naphthalene	5.1	U
Toluene	5.1	U	1,2,3-Trichlorobenzene	5.1	U
Trans-1,3-Dichloropropene	4.8	U			
1,1,2-Trichloroethane	5.1	U			
3-Dichloropropane	5.1	U			
2-Hexanone	10	U			
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Authorized By:	Release Date:	Page:	1

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498084

Method: SW8260

Field ID: LARSS3C01

Date Collected: 12/09/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units:

ug/Kg dw

Surrogate Recoveries

1,2-Dichloroethane-D4	118	%
1,4-Difluorobenzene	105	%
Toluene-D8	107	%
p-Bromofluorobenzene	96	%
1,2-Dichlorobenzene-D4	96	%

Authorized By:	 Release Date:	

Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498085

Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3D01

Matrix: Sediment/Soil

1

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units: ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	5	U	Tetrachloroethene	5	U
Chloromethane	5	U	Dibromochloromethane	5	U
Vinyl Chloride	5	U	1,2-Dibromoethane (EDB)	5	U
Bromomethane	5	${f U}$	Chlorobenzene	5 5 5 5	U
Chloroethane	5	U	1,1,1,2-Tetrachloroethane	5	U
Trichlorofluoromethane	5	${f U}$	Ethylbenzene	5	U
Ethyl Ether	5	U	m & p-Xylene	10	U
1,1,2 Trichlorotrifluoroethane	5	U	o-Xylene	5	Ū
1,1-Dichloroethene	5	Ù	Styrene	. 5	U
Acetone	10	U ·	Bromoform	5 5	U
Methyl Iodide	5	U	Isopropylbenzene (Cumene)	5	Ū
Carbon Disulfide	10	U	1,1,2,2-Tetrachloroethane	20	· U
Methylene Chloride	14		Trans-1,4-Dichloro-2-butene	5	Ū
Methyl t-butyl ether	5	U	1,2,3-Trichloropropane	5	Ū
Trans-1,2-Dichloroethene	5	U	Bromobenzene	5 5	Ū
1,1-Dichloroethane	5	U	n-Propylbenzene	5	Ū
2-Butanone	5	U	2-Chlorotoluene	5	Ū
Cis-1,2-Dichloroethene	5	U	1,3,5-Trimethylbenzene	5	Ū
2,2-Dichloropropane	.5	U	4-Chlorotoluene	5 5 5	Ŭ'
Bromochloromethane	5	U	Tert-Butylbenzene		Ū.
Chloroform	5	U	1,2,4-Trimethylbenzene	5 5 5 5 5	Ū
Tetrahydrofuran	5	U	Pentachloroethane	5	Ŭ
1,1,1-Trichloroethane	5	Ü	Sec-Butylbenzene	5	Ū
1,1-Dichloropropene	5	Ū	p-Isopropyltoluene	5	Ŭ
Carbon Tetrachloride	5	Ū	1,3-Dichlorobenzene	5	Ü
1,2-Dichloroethane	5	Ŭ	1,4-Dichlorobenzene		Ū
Benzene	5	Ŭ	n-Butylbenzene	5	Ŭ
Trichloroethene	5	Ŭ	1,2-Dichlorobenzene	5	Ŭ
1,2-Dichloropropane	5	Ū	Hexachloroethane	5	Ŭ
Dibromomethane	5	Ŭ	1,2-Dibromo-3-Chloropropane	5	Ŭ
Bromodichloromethane	5	Ŭ	1,2,4-Trichlorobenzene	รั	Ŭ
Cis-1,3-Dichloropropene	5.3	Ŭ	Hexachlorobutadiene	5 5 5 5 5 5	Ü
4-Methyl-2-Pentanone	10	Ŭ	Naphthalene	5	Ŭ
Toluene	5	Ü.	1,2,3-Trichlorobenzene	5	Ŭ
Trans-1,3-Dichloropropene	4.7	Ü	1,2,5 11011010110110	•	~
1,1,2-Trichloroethane	5	Ŭ			
1,3-Dichloropropane	5	Ŭ			
2-Hexanone	10	Ŭ	• •		

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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498085

Date Collected: 12/09/99

Method: SW8260

Field ID: LARSS3D01

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units:

ug/Kg dw

Surrogate Recoveries

1,2-Dichloroethane-D4	111	%
1,4-Difluorobenzene	97	%
Toluene-D8	102	%
p-Bromofluorobenzene	90	%
1,2-Dichlorobenzene-D4	98	%

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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: ODBS9362

Method: SW8260

QC Type: Laboratory Method Blank

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units: ug/Kg dw

Analyte	Result	Qualifier	Analyte	Result	Qualifier
Dichlorodifluoromethane	5	U	Tetrachloroethene	5	U
Chloromethane	5 5 5	U	Dibromochloromethane	5	Ū
Vinyl Chloride	5 .	U	1,2-Dibromoethane (EDB)	5	U.
Bromomethane	5	U	Chlorobenzene	5	U
Chloroethane	5 5 5 5	U	1,1,1,2-Tetrachloroethane	5	Ū
Trichlorofluoromethane	5	U	Ethylbenzene	5	U
Ethyl Ether	5	U	m & p-Xylene	10	U
1,1,2 Trichlorotrifluoroethane	5	U ·	o-Xylene	5	U
1,1-Dichloroethene	5	U	Styrene	5	U
Acetone	10	U	Bromoform	5	Ū
Methyl Iodide	5	· U	Isopropylbenzene (Cumene)	5	Ū
Carbon Disulfide	10	U	1,1,2,2-Tetrachloroethane	20	Ū
Methylene Chloride	5	Ū	Trans-1,4-Dichloro-2-butene		U
Methyl t-butyl ether	5	Ū	1,2,3-Trichloropropane	5 5	Ū
Trans-1,2-Dichloroethene	5	Ū	Bromobenzene	5	. Ū
1,1-Dichloroethane	5	Ū	n-Propylbenzene	5	Ū
2-Butanone	5	Ū	2-Chlorotoluene	5 5 5	Ŭ
Cis-1,2-Dichloroethene	5	Ŭ	1,3,5-Trimethylbenzene	5	Ū
2,2-Dichloropropane	5	Ü	4-Chlorotoluene	5	Ŭ
Bromochloromethane	5	Ŭ	Tert-Butylbenzene	5	Ŭ
Chloroform	.32	J	1,2,4-Trimethylbenzene	5 5 5 5	Ū
Tetrahydrofuran	5	Ŭ	Pentachloroethane	5	Ū
1,1,1-Trichloroethane	5	Ū	Sec-Butylbenzene	5	Ū
1,1-Dichloropropene	5	Ü	p-Isopropyltoluene	5	Ŭ
Carbon Tetrachloride	5	Ū	1,3-Dichlorobenzene	5	Ŭ
1,2-Dichloroethane	5	Ŭ	1,4-Dichlorobenzene	5 5	Ŭ
Benzene	5	Ū	n-Butylbenzene	5	Ü
Trichloroethene	5	Ŭ	1,2-Dichlorobenzene	5	Ŭ
1,2-Dichloropropane	5	Ŭ	Hexachloroethane	5	Ŭ
Dibromomethane	5	Ŭ	1,2-Dibromo-3-Chloropropane	5	Ŭ
Bromodichloromethane	5	, Ŭ	1,2,4-Trichlorobenzene	5 5 5 5 5	บั
Cis-1,3-Dichloropropene	5.4	Ü	Hexachlorobutadiene	5	Ü
4-Methyl-2-Pentanone	10	Ŭ	Naphthalene	5	Ŭ
Toluene	.57	J	1,2,3-Trichlorobenzene	5	Ŭ.
Trans-1,3-Dichloropropene	4.7	U	1,2,5 211011010001120110	3	
1,1,2-Trichloroethane	5	Ü	₹		
1,3-Dichloropropane	5	Ŭ	:		
2-Hexanone	10	Ŭ	1. 1		
2 Hondione		,	· .		

Authorized By: KF	Release Date://6/00	Page:
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Department of Ecology

Analysis Report for

Volatile Organic Analysis

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: ODBS9362

Method: SW8260

Matrix: Sediment/Soil

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Analyzed: 12/28/99

Units:

ug/Kg dw

Surrogate Recoveries

1,2-Dichloroethane-D4	97	%
1,4-Difluorobenzene	99	%
Toluene-D8	100	%
p-Bromofluorobenzene	95	%
1,2-Dichlorobenzene-D4	105	%

Authorized By:	Release Date:	
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Washington Department of Ecology

Manchester Environmental Laboratory 7411 Beach Drive East Port Orchard, WA 98366

January 19, 2000

TO:

Guy Barrett

FROM:

Jim Ross, Manchester Lab

SUBJECT:

Quality Assurance memo for the FUDS Larson S-3 week 49 metals monitoring

(sediment)

SUMMARY

Antimony data for these samples was qualified as estimated due to low spike recoveries. All other data for this project met all quality assurance and quality control criteria and can be used without qualification.

SAMPLE RECEIPT

The samples were received by the Manchester Laboratory on 12/10/99

HOLDING TIMES

All analyses were performed within the specified holding time (28 days for Hg, 180 days all other metals).

INSTRUMENT CALIBRATION

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards and blanks were within the relevant control limits.

PROCEDURAL BLANKS

The procedural blanks associated with these samples showed no analytically significant levels of requested analyte.

SPIKED SAMPLE ANALYSES

Antimony spike recoveries were low (27,28%). Antimony data was qualified as estimated ("J"). All other spike and duplicate spike recoveries met the acceptance criteria (75-125%).

PRECISION DATA

Precision estimates based on duplicate spike analysis were all within the acceptance criteria for duplicate analysis $(\pm 20\%)$

LABORATORY CONTROL SAMPLE (LCS) ANALYSES

All LCS analyses were within the acceptance criteria for the individual analytes. (80-120%)

Please call Jim Ross at (360) 871-8808 to further discuss this project.

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: M9349SB1

Method: SW6010

QC Type: Laboratory Method Blank

Matrix: Sediment/Soil **Date Prepared:** 12/15/99

Project Officer: Guy Barrett

Date Analyzed: 12/21/99 **Units:** mg/Kg dw

Analyte	Result Qualifier	
Antimony Beryllium Cadmium Chromium Copper Nickel Silver Zinc	5 U 0.1 U 0.5 U 0.5 U 0.5 U 1 U 1 U 0.5 U	

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: M9349SL1

Method: SW6010

QC Type: ERA Solid Reference Material

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Prepared: 12/15/99 Date Analyzed: 12/21/99

Units: mg/Kg dw

Analyte	Result	Qualifier				
Antimony	99	%				
Beryllium	. 112	%				٠
Cadmium	98	%				
Chromium	105	%				
Copper	100	%		•.		
Nickel	104	%	•			
Silver	109	%				
Zinc	92	%				

Authorized By:

Release Date:

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498086

Date Collected: 12/09/99

Method: SW6010

Field ID: LARSS3E01

Project Officer: Guy Barrett

Date Prepared: 12/15/99 Date Analyzed: 12/21/99 Matrix: Sediment/Soil **Units:** mg/Kg dw

Analyte	Result	Qualifier			
Antimony	. 5	UJ			•
Antimony	3				
Beryllium	0.3	\mathbf{U}			
Cadmium	0.5	U			
Chromium	10.7	•			
Copper	10.7				
Nickel	9.3			•	•
Silver	1 .	U	•		
Zinc	37.8				

Authorized By:

Release Date:

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498086 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: SW6010

Field ID: LARSS3E01

Date Prepared: 12/15/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/21/99

Units: % Recovery

Result Qualifier
25
27
101
93
99
92
96
103
85

Authorized By:

Release Date: 1/11/Co

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498086 (Matrix Spike - LMX1) Date Collected: 12/09/99

Method: SW6010

Field ID: LARSS3E01

Date Prepared: 12/15/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/21/99

Units:

% Recovery

Analyte	Result Qualifie	<u>r </u>	·
Antimony	28		
Beryllium	98		
Cadmium	94		
Chromium	97		•
Copper	90		· .
Nickel	94	- š	
Silver	97		
Zinc	85	•	

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498088
Field ID: LARS3A02SED
Project Officer: Guy Barrett

Date Collected: 12/09/99 **Date Prepared:** 12/15/99

Method: SW6010 Matrix: Sediment/Soil

Date Analyzed: 12/21/99 Units: sediment/so mg/Kg dw

Analyte	Result Qualifier	
Antimony	5 UJ	
Beryllium	0.2 U	
Cadmium	0.5 U	•
Chromium	7.21	
Copper	6.86	•
Nickel	7.0	
Silver	1 U	
Zinc	49.6	
211.0		

Authorized By:

Release Date: ///2/cc

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Department of Ecology

Analysis Report for

Arsenic

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

Method: SW7060 Matrix: Sediment/Soil

Analyte: Arsenic

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99498086 99498086 99498086 99498088 M9349SB M9349SL	Matrix l		3.04 93 % 93 % 2.7 0.3 116	U	ug/Kg dw ug/Kg dw ug/Kg dw %	12/09/99 12/09/99 12/09/99 12/09/99	12/27/99 12/27/99 12/27/99 12/27/99 12/27/99 12/27/99

Authorized By: Kandy & Knn

Release Date: 12/27/99

Department of Ecology

Analysis Report for

Lead

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

SW7421 Method:

Matrix: Sediment/Soil

Analyte: Lead

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99498086 99498086 99498086 99498088 M9349SB M9349SL			5.71 90 % 95 % 69.6 0.2 109	U	mg/Kg dw mg/Kg dw mg/Kg dw	12/09/99 12/09/99 12/09/99 12/09/99	12/22/99 12/22/99 12/22/99 12/22/99 12/22/99 12/22/99

Authorized By:

Release Date:

Department of Ecology

Analysis Report for

Selenium

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

Method: SW7740 Matrix: Sediment/Soil

Analyte: Selenium

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99498086 99498086 99498086 99498088 M9349SB M9349SL			0.3 104 % 108 % 0.3 0.3 88	Ŭ U U	mg/Kg dw mg/Kg dw mg/Kg dw %	12/09/99 12/09/99 12/09/99 12/09/99	12/21/99 12/21/99 12/21/99 12/21/99 12/21/99 12/21/99

Authorized By: Kandy P San

Release Date: 12/27/99

Department of Ecology

Analysis Report for

Thallium

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

Method: SW7841 Matrix: Sediment/Soil

Analyte: Thallium

Sample QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
	LARSS3E01 rix Spike rix Spike LARS3A02SED	0.6 94 % 97 % 0.6 0.6 115	U U U	mg/Kg dw mg/Kg dw mg/Kg dw	12/09/99 12/09/99 12/09/99 12/09/99	12/21/99 12/21/99 12/21/99 12/21/99 12/21/99 12/21/99

Authorized By: Kandy & Kny

Release Date: 12/27/9

Department of Ecology

Analysis Report for

Mercury

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 22-DEC-99

Method: EPA245.5

Matrix: Sediment/Soil Analyte: Mercury

Sample QC Field ID	Result Qualifier	Units	Collected Analyzed
99498086 LARSS3E01 99498088 LARS3A02SI 99498088 Matrix Spike 99498088 Matrix Spike M9354SG M9354SH	0.0059 D 0.017 106 % 103 % 116 0.005 U	mg/Kg dw mg/Kg dw mg/Kg dw mg/Kg dw	12/09/99 12/20/99 12/09/99 12/20/99 12/09/99 12/20/99 12/09/99 12/20/99 12/20/99

Authorized By: ___ally Gull

Release Date: 12/2/95

Washington Department of Ecology

Manchester Environmental Laboratory 7411 Beach Drive East Port Orchard, WA 98366

January 19, 2000

TO:

Guy Barrett

FROM:

Jim Ross, Manchester Lab

SUBJECT:

Quality Assurance memo for the FUDS Larson S-3 week 49 metals monitoring

(waters)

SUMMARY

Data for this project met all quality assurance and quality control criteria and can be used without qualification.

SAMPLE RECEIPT

The samples were received by the Manchester Laboratory on 12/10/99

HOLDING TIMES

All analyses were performed within the specified holding time (28 days for Hg, 180 days all other metals).

INSTRUMENT CALIBRATION

Instrument calibration was performed before each analytical run and checked by initial calibration verification standards and blanks. Continuing calibration standards and blanks were analyzed at a frequency of 10% during the run and again at the end of the analytical run. All initial and continuing calibration verification standards and blanks were within the relevant control limits.

PROCEDURAL BLANKS

The procedural blanks associated with these samples showed no analytically significant levels of requested analyte.

SPIKED SAMPLE ANALYSES

All spike and duplicate spike recoveries met the acceptance criteria (75-125%).

PRECISION DATA

Precision estimates based on duplicate spike analysis were all within the acceptance criteria for duplicate analysis ($\pm 20\%$)

LABORATORY CONTROL SAMPLE (LCS) ANALYSES

All LCS analyses were within the acceptance criteria for the individual analytes. (80-120%)

Please call Jim Ross at (360) 871-8808 to further discuss this project.

Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: M9348WB1

QC Type: Laboratory Method Blank

Project Officer: Guy Barrett

Date Prepared: 12/13/99 Date Analyzed: 12/21/99

Method: EPA200.7 Matrix: Water

Units: ug/L

Analyte	Result	Qualifier				
Antimony	50	U				•
Beryllium	1	U .				
Cadmium	5	U				
Chromium	5	U	•	•		
	5	U			•	
Copper Nickel	10	U				
Silver	10	U				
Zinc	5	Ū				٠

Authorized By:

Release Date: 1/12/00

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: M9348WL2

QC Type: Laboratory Control Sample Project Officer: Guy Barrett

Date Prepared: 12/13/99

Method: EPA200.7

Date Analyzed: 12/21/99

Matrix: Water

Units: ug/L

Analyte	Result	Qualifier	· · · · · · · · · · · · · · · · · · ·		·	
Antimony	104	%				
Beryllium	102	%	•			
Cadmium	98	%				
Chromium	100	%				
Copper	98	%				~
Nickel	102	%				
Silver	110	%	•			
Zinc	94	%				

Authorized By:

Release Date: ///2/00

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name: Fuds Larson S-3 - 49

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LIMS Project ID: 3113-99

Sample: 99498081 Field ID: LARSS3A02 Date Collected: 12/09/99

Method: EPA200.7

Analyte

Antimony Beryllium

Cadmium

Copper

Nickel

Silver

Zinc

Chromium

Date Prepared: 12/13/99

Matrix: Water ug/L

Project Officer: Guy Barrett

Date Analyzed: 12/21/99 **Units:**

Result Qualifier U U U U U U U

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498081 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: EPA200.7

Field ID: LARSS3A02

Matrix: Water

Date Prepared: 12/13/99 Date Analyzed: 12/21/99

Project Officer: Guy Barrett

Units:

% Recovery

Analyte	Result Qualifier		
Antimony	106		
Beryllium	104		
Cadmium	97		
Chromium	100		
Copper	94	. *	
Nickel	97	7.	
Silver	100		
Zinc	92		

Authorized By:

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Department of Ecology

Analysis Report for

Inductively Coupled Plasma

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498081 (Matrix Spike - LMX1) Date Collected: 12/09/99

Method: EPA200.7 Date Prepared: 12/13/99 Matrix: Water

Field ID: LARSS3A02

Project Officer: Guy Barrett

Date Analyzed: 12/21/99

Units:

% Recovery

Analyte	Result Qualifier	
· · • • • • • • • • • • • • • • • • • •	103	
Antimony	102	
Beryllium	100	
Cadmium	97	
Chromium	97	
Copper	93	
Nickel	96	•
Silver	94	
Zinc	93	

Authorized By:

Release Date:

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Department of Ecology

Analysis Report for

Arsenic

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

Method: EPA206.2 Matrix: Water

Analyte: Arsenic

Sample QC Field ID	Result Qualifier	Units	Collected	Analyzed
99498081 LARSS3A02 99498081 Matrix Spike 99498081 Matrix Spike M9348WB1 M9348WL1	8.1 104 % 103 % 1.5 U	ug/L ug/L %	12/09/99 12/09/99 12/09/99	12/27/99 12/27/99 12/27/99 12/27/99 12/27/99

Authorized By: Mandy & Drug

Release Date: $\frac{289}{9}$

Department of Ecology

Analysis Report for

Lead

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 28-DEC-99

Method: EPA239.2 Matrix: Water

Matrix: Water Analyte: Lead

Sample QC Field ID	Result Qualifier Units	Collected Analyzed
99498081 LARSS3A02 99498081 Matrix Spike 99498081 Matrix Spike M9348WB1 M9348WL1	2.9 ug/L 101 % 105 % 1 U ug/L 102 %	12/09/99 12/22/99 12/09/99 12/22/99 12/09/99 12/22/99 12/22/99

Authorized By: Kandy & Kny

Release Date: 12/28/95

Department of Ecology

Analysis Report for

Selenium

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

Method: EPA270.2 Matrix: Water

Analyte: Selenium

Sample QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99498081 99498081 Matr 99498081 Matr M9348WB1 M9348WL1	LARSS3A02 ix Spike ix Spike	1.5 119 % 121 % 1.5 111	U U	ug/L wg/L	12/09/99 12/09/99 12/09/99	12/21/99 12/21/99 12/21/99 12/21/99 12/21/99

Authorized By: Randy & Kny

Release Date: 12/25/59

Department of Ecology

Analysis Report for

Thallium

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 27-DEC-99

Barrett Method:

EPA279.2

Matrix: Analyte:

Water Thallium

Sample	QC	Field ID	Result	Qualifier	Units	Collected	Analyzed
99498081 99498081 99498081 M9348WE M9348WI	Matrix S 31		1.5 108 % 107 % 1.5 113	u u	ug/L ug/L %	12/09/99 12/09/99 12/09/99	12/21/99 12/21/99 12/21/99 12/21/99 12/21/99

Authorized By: Mandy & Kny

Release Date: 12/28/99

Department of Ecology

Analysis Report for

Mercury

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Project Officer: Guy Barrett **Date Reported:** 21-DEC-99

Method: EPA245.1 Matrix: Water

Analyte:

Water Mercury

Sample	QC Field	ID Result	Qualifier	Units	Collected	Analyzed
	Matrix Spike Matrix Spike	0.030 101 % 101 % 98 0.030	U U	ug/L % ug/L	12/09/99 12/09/99 12/09/99	12/21/99 12/21/99 12/21/99 12/20/99 12/20/99

Authorized By: Release Date: 12/21/99 Page: 1

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive E., Port Orchard Washington 98366

January 25, 2000

Subject:

FUDS Larson ≤-3

Samples:

99498082 (water) 99498089 (soil)

Project ID:

311399

Project Officer:

Guy Barrett

By:

Greg Pero

SEMIVOLATILE ORGANICS

ANALYTICAL METHODS:

The samples were extracted following the EPA CLP and SW-846 8270 procedure. The soil extract was cleaned up with Gel Permeation Chromatography (GPC). Analysis was by capillary gas chromatography with mass spectrometry (GC/MS). Routine QA/QC procedures were performed with the analyses.

HOLDING TIMES:

The samples were stored at 4 degrees C until extraction. They were extracted and analyzed within the recommended holding times.

BLANKS:

Low levels of some analytes were detected in the laboratory blanks. An analyte is considered native to the sample when the on-column concentration is at least five times greater than in the associated method blanks. A phthalate is considered native to the sample when the concentration is at least ten times greater than in the associated method blanks.

SURROGATES:

The standard Manchester Laboratory Base/Neutral/Acid (BNA) surrogates were added to the sample prior to extraction. All surrogate recoveries were within acceptable limits.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Sample 498089 was spiked to evaluate recoveries from this type of sample. Results for analytes with recoveries below 50% in one or both spikes have been qualified "J" in the corresponding samples.

Results for analytes with recoveries below 10% in one or both spikes have been rejected (qualifier "REJ") in the corresponding samples.

COMMENTS:

The data is acceptable for use as reported.

DATA QUALIFIER CODES:

U	-	The analyte was not detected at or above the reported value.

- J The analyte was positively identified. The associated numerical value is an estimate.
- UJ The analyte was not detected at or above the reported estimated result.
- REJ The data are unusable for all purposes.
- NAF Not analyzed for.
- N There is evidence the analyte is present in the sample.
- NJ There is evidence that the analyte is present. The associated numerical result is an estimate.
- E This qualifier is used when the concentration of the associated value exceeds the known calibration range. The associated numerical result is an estimate.
- bold .- The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498089
Field ID: LARS3A03SED
Project Officer: Guy Barrett

Date Collected: 12/09/99 Method: SW8270
Date Prepared: 12/14/99 Matrix: Sediment/Soil
Date Analyzed: 12/23/99 Units: ug/Kg dw

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12 12 12 12 12 12 24 12 12 12	U UJ U U U U U U
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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498089 Field ID: LARS3A03SED Project Officer: Guy Barrett Date Collected: 12/09/99 Date Prepared: 12/14/99

Method: SW8270 Matrix: Sediment/Soil **Units:**

Date Analyzed: 12/23/99

ug/Kg dw

Surrogate Recoveries

2-Fluorophenol	66	%
D5-Phenol	62	%
D4-2-Chlorophenol	62	%
1,2-Dichlorobenzene-D4	45	%
D5-Nitrobenzene	64	%
2-Fluorobiphenyl	63	%
Pyrene-D10	74	%
Terphenyl-D14	73	%

Authorized By:	Release Date: 1/25/00	Page:	2
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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498089 Date Collected: 12/09/99 Method: SW8270 Field ID: LARS3A03SED Date Prepared: 12/14/99 Matrix: Sediment/Soil

Project Officer: Guy Barrett Date Analyzed: 12/23/99 Units: ug/Kg dw

Tentatively Identified Compounds

CAS Number Analyte Description Result Qualifier

42981760 Naphthalene, 2,6-bis(1,1-dimethylethyl)-1,2,3,4-tet 32 NJ

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498089 (Matrix Spike - LMX1) Date Collected: 12/09/99 Field ID: LARS3A03SED Date Prepared: 12/14/99 Method: SW8270 **Date Prepared:** 12/14/99 Matrix: Sediment/Soil Project Officer: Guy Barrett

Date Analyzed: 12/23/99 % Recovery **Units:**

Analyte	Result	Qualifier	Analyte	Result	Qualifie
N-Nitrosodimethylamine	67		Acenaphthene	73	
Pyridine	12		2,4-Dinitrophenol	26	
Aniline	27		4-Nitrophenol	64	
Phenol	76		Dibenzofuran	70	
Bis(2-Chloroethyl)Ether	74		2,4-Dinitrotoluene	71	
2-Chlorophenol	71		Diethylphthalate	73	
1,3-Dichlorobenzene	61		Fluorene	74	
1,4-Dichlorobenzene	64		4-Chlorophenyl-Phenylether	79	
1,2-Dichlorobenzene	68		4-Nitroaniline	42	
Benzyl Alcohol	62		4,6-Dinitro-2-Methylphenol	66	
2-Methylphenol	67		N-Nitrosodiphenylamine	82	
2,2'-Oxybis[1-chloropropane]	75		1,2-Diphenylhydrazine		NAF
N-Nitroso-Di-N-Propylamine	76		4-Bromophenyl-Phenylether	81	- 12
4-Methylphenol	70		Hexachlorobenzene	85	
Hexachloroethane	58		Pentachlorophenol	55	
Nitrobenzene	70		Phenanthrene	79	
sophorone	74		Anthracene	77	
2-Nitrophenol	72		Caffeine	12	
2,4-Dimethylphenol	61		Carbazole	~~ .	NAF
Bis(2-Chloroethoxy)Methane	78		Di-N-Butylphthalate	79	11111
Benzoic Acid	43		Fluoranthene	80	
2,4-Dichlorophenol	75		Benzidine	28	. • .
1,2,4-Trichlorobenzene	70		Pyrene	80	•
Naphthalene	72		Retene	12	
-Chloroaniline	31		Butylbenzylphthalate	78	
Hexachlorobutadiene	68		Benzo(a)anthracene	76 76	•
4-Chloro-3-Methylphenol	78		3,3'-Dichlorobenzidine	12	
2-Methylnaphthalene	67		Chrysene	77	
l-Methylnaphthalene	07	NAF	Bis(2-Ethylhexyl) Phthalate	72	
Hexachlorocyclopentadiene	0	TALM.	Di-N-Octyl Phthalate	68	
2,4,6-Trichlorophenol	78		Benzo(b)fluoranthene	73	
2,4,5-Trichlorophenol	63		Benzo(k)fluoranthene	74 74	
	75		Benzo(a)pyrene	7 4 72	
-Chioronaphthalene -Nitroaniline	67		3B-Coprostanol	24	
-introamme Dimethylphthalate	79		Indeno(1,2,3-cd)pyrene	66	•
7,6-Dinitrotoluene	69		Dibenzo(a,h)anthracene	82	
Acenaphthylene	70		Benzo(ghi)perylene	73	
Acenaphtnylene 3-Nitroaniline	44		Denzo(gui)peryiene	13	

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498089 (Matrix Spike - LMX1) Date Collected: 12/09/99

Method: SW8270

Field ID: LARS3A03SED

Date Prepared: 12/14/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/23/99

% Recovery **Units:**

Surrogate Recoveries

2-Fluorophenol	70	%
D5-Phenol	68	%
D4-2-Chlorophenol	66	%
1,2-Dichlorobenzene-D4	37	%
D5-Nitrobenzene	66	%
2-Fluorobiphenyl	65	%
Pyrene-D10	74	%
Terphenyl-D14	76	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498089 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: SW8270

Field ID: LARS3A03SED Date Prepared: 12/14/99 Matrix: Sediment/Soil Date Analyzed: 12/23/99 **Units:** Project Officer: Guy Barrett % Recovery

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	61		Acenaphthene	69	•
Pyridine	12		2,4-Dinitrophenol	28	
Aniline	25		4-Nitrophenol	61	
Phenol	72		Dibenzofuran	66	
Bis(2-Chloroethyl)Ether	66	•	2,4-Dinitrotoluene	74	
2-Chlorophenol	68		Diethylphthalate	66	
1,3-Dichlorobenzene	53		Fluorene	70	
1,4-Dichlorobenzene	56		4-Chlorophenyl-Phenylether	74	
1,2-Dichlorobenzene	60		4-Nitroaniline	39	
Benzyl Alcohol	64		4,6-Dinitro-2-Methylphenol	59	
2-Methylphenol	63		N-Nitrosodiphenylamine	68	
2,2'-Oxybis[1-chloropropane]	70		1,2-Diphenylhydrazine		NAF
N-Nitroso-Di-N-Propylamine	72		4-Bromophenyl-Phenylether	71	211.22
4-Methylphenol	65		Hexachlorobenzene	74	
Hexachloroethane	51		Pentachlorophenol	51	
Nitrobenzene	66		Phenanthrene	76	
Isophorone	68		Anthracene	64	
2-Nitrophenol	66		Caffeine	12	
2,4-Dimethylphenol	52		Carbazole	12	NAF
Bis(2-Chloroethoxy)Methane	73		Di-N-Butylphthalate	66	IVAL
Benzoic Acid	46		Fluoranthene	69	
2,4-Dichlorophenol	69		Benzidine	26	
1,2,4-Trichlorobenzene	64		Pyrene	73	
	66		Retene	12	
Naphthalene 4-Chloroaniline	29		Butylbenzylphthalate	73	
	62		Benzo(a)anthracene	73 71	
Hexachlorobutadiene	73			12	
4-Chloro-3-Methylphenol			3,3'-Dichlorobenzidine	72	
2-Methylnaphthalene	61		Chrysene		
1-Methylnaphthalene	12		Bis(2-Ethylhexyl) Phthalate	65	
Hexachlorocyclopentadiene	0		Di-N-Octyl Phthalate	61	
2,4,6-Trichlorophenol	73		Benzo(b)fluoranthene	70	•
2,4,5-Trichlorophenol	61		Benzo(k)fluoranthene	69	
2-Chloronaphthalene	70		Benzo(a)pyrene	67	
2-Nitroaniline	64		3B-Coprostanol	24	
Dimethylphthalate	74		Indeno(1,2,3-cd)pyrene	68	
2,6-Dinitrotoluene	71		Dibenzo(a,h)anthracene	63	
Acenaphthylene	66		Benzo(ghi)perylene	69	•
3-Nitroaniline	38				

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498089 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: SW8270

Field ID: LARS3A03SED

Date Prepared: 12/14/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/23/99

Units:

% Recovery

Surrogate Recoveries

2-Fluorophenol	67	%
D5-Phenol	64	%
D4-2-Chlorophenol	62	%
1,2-Dichlorobenzene-D4	41	%
D5-Nitrobenzene	61	%
2-Fluorobiphenyl	61	· %
Pyrene-D10	69	%
Terphenyl-D14	70	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9348A1

Method:

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Prepared: 12/14/99 **Date Analyzed:** 12/23/99

Matrix: Sediment/Soil

Units:

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	12	Ü	Acenaphthene		; <u>U</u>
Pyridine	12	Ü	2,4-Dinitrophenol	242	U
Aniline	12	U	4-Nitrophenol	12	U
Phenol	13		Dibenzofuran	12	\mathbf{U}
Bis(2-Chloroethyl)Ether	12	U	2,4-Dinitrotoluene	12	Ū
2-Chlorophenol	12	U	Diethylphthalate	9	J
1,3-Dichlorobenzene	12	U	Fluorene	12	U .
1,4-Dichlorobenzene	12	\mathbf{U}	4-Chlorophenyl-Phenylether	12	U
1,2-Dichlorobenzene	12	U	4-Nitroaniline	12	U
Benzyl Alcohol	9.7	J	4,6-Dinitro-2-Methylphenol	24	U
2-Methylphenol	12	U	N-Nitrosodiphenylamine	12	U
2,2'-Oxybis[1-chloropropane]	12	U	1,2-Diphenylhydrazine	18	•
N-Nitroso-Di-N-Propylamine	12	${f U}$	4-Bromophenyl-Phenylether	12	\mathbf{U}_{\cdot}
4-Methylphenol	12	U	Hexachlorobenzene	12	U
Hexachloroethane	12	U	Pentachlorophenol	12	U
Nitrobenzene	12	U	Phenanthrene	1.6	J
Isophorone	12	U	Anthracene	12	Ŭ
2-Nitrophenol	12	U.	Caffeine	12	U
2,4-Dimethylphenol	12	U	Carbazole	12	Ŭ
Bis(2-Chloroethoxy)Methane	12	Ū	Di-N-Butylphthalate	11	J
Benzoic Acid	50	J	Fluoranthene	12	Ŭ
2,4-Dichlorophenol	12	Ŭ	Benzidine	12	Ū
1,2,4-Trichlorobenzene	12	Ū	Pyrene	12	Ü
Naphthalene	12	Ū	Retene	12	Ū
4-Chloroaniline	12	Ŭ	Butylbenzylphthalate	12	Ŭ
Hexachlorobutadiene	12	Ŭ	Benzo(a)anthracene	12	Ŭ
4-Chloro-3-Methylphenol	12	Ŭ	3,3'-Dichlorobenzidine	12	Ŭ
2-Methylnaphthalene	12	Ŭ	Chrysene	12	Ŭ
1-Methylnaphthalene	12	Ŭ	Bis(2-Ethylhexyl) Phthalate	61	Ü
Hexachlorocyclopentadiene	12	Ŭ	Di-N-Octyl Phthalate	12	U
2,4,6-Trichlorophenol	12	Ŭ	Benzo(b)fluoranthene	12	Ŭ ·
2,4,5-Trichlorophenol	12	Ŭ	Benzo(k)fluoranthene	12	·Ŭ
مأمأه والمأما	12	Ŭ	Benzo(a)pyrene	12	Ü
2-Chloronaphthalene 2-Nitroaniline	12	Ŭ	3B-Coprostanol	24	UJ
Dimethylphthalate	12	Ü	Indeno(1,2,3-cd)pyrene	12	U
2,6-Dinitrotoluene	12	Ŭ	Dibenzo(a,h)anthracene	12	Ü
Acenaphthylene	12	Ü	Benzo(ghi)perylene	12	Ü
3-Nitroaniline	12	Ü	Delizo(Ritt)het Atette	12	U
J-141ti Oaintinie	12	U			

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9348A1

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Method:

Date Prepared: 12/14/99 Date Analyzed: 12/23/99

Matrix: Sediment/Soil

Units:

Surrogate Recoveries

2-Fluorophenol	66	%
D5-Phenol	62	%
D4-2-Chlorophenol	63	%
1,2-Dichlorobenzene-D4	66	%
D5-Nitrobenzene	66	%
2-Fluorobiphenyl	66	%
Pyrene-D10	73	%
Terphenyl-D14	75	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9348A2

Method: Matrix: Sediment/Soil Date Prepared: 12/14/99

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Analyzed: 12/23/99

Units:

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	12	U	Acenaphthene	12	U
Pyridine	12	Ŭ	2,4-Dinitrophenol	242	Ŭ
Aniline	12	· Ŭ	4-Nitrophenol	12	Ŭ
Phenol	13	O	Dibenzofuran	12	Ŭ
Bis(2-Chloroethyl)Ether	12	U	2,4-Dinitrotoluene	12	Ŭ
2-Chlorophenol	12	Ŭ	Diethylphthalate	4.7	$\ddot{\mathbf{J}}$
1,3-Dichlorobenzene	12	Ŭ	Fluorene	12	Ü
1,4-Dichlorobenzene	12	Ŭ	4-Chlorophenyl-Phenylether	12	Ü
1,2-Dichlorobenzene	12	Ŭ	4-Nitroaniline	12	Ŭ
Benzyl Alcohol	11	Ĵ	4,6-Dinitro-2-Methylphenol	24	Ŭ
2-Methylphenol	12	Ŭ	N-Nitrosodiphenylamine	12	Ŭ
2,2'-Oxybis[1-chloropropane]	12	Ŭ	1,2-Diphenylhydrazine	12	Ŭ
N-Nitroso-Di-N-Propylamine	12	Ŭ	4-Bromophenyl-Phenylether	12	Ŭ.
4-Methylphenol	12	Ŭ	Hexachlorobenzene	12	Ŭ
Hexachloroethane	12	Ŭ	Pentachlorophenol	12	Ü
Nitrobenzene	12	Ŭ	Phenanthrene	12	Ŭ
Isophorone	12	Ŭ	Anthracene	12	Ŭ
2-Nitrophenol	12	Ŭ	Caffeine	12	Ŭ
2,4-Dimethylphenol	12	Ŭ	Carbazole	12	Ü
Bis(2-Chloroethoxy)Methane	12	Ŭ	Di-N-Butylphthalate	12	J
Benzoic Acid	242	Ŭ	Fluoranthene	12	Ŭ
2,4-Dichlorophenol	12	Ŭ	Benzidine	12	Ŭ
1,2,4-Trichlorobenzene	12	Ŭ	Pyrene	12	Ŭ
Naphthalene	12	Ŭ	Retene	12	Ŭ
4-Chloroaniline	12	Ŭ	Butylbenzylphthalate	12	Ŭ
Hexachlorobutadiene	12	Ū	Benzo(a)anthracene	2	j
4-Chloro-3-Methylphenol	12	Ŭ	3,3'-Dichlorobenzidine	1 2.	Ŭ
2-Methylnaphthalene	12	Ŭ	Chrysene	12	Ŭ
1-Methylnaphthalene	12	Ŭ	Bis(2-Ethylhexyl) Phthalate	385	Ü
Hexachlorocyclopentadiene	12	Ū	Di-N-Octyl Phthalate	12	U
2,4,6-Trichlorophenol	12	Ŭ	Benzo(b)fluoranthene	12	Ŭ
2,4,5-Trichlorophenol	12	Ŭ	Benzo(k)fluoranthene	12	Ŭ
2-Chloronaphthalene	12	Ŭ	Benzo(a)pyrene	12	Ŭ
2-Nitroaniline	12	Ŭ	3B-Coprostanol	24	Ū
Dimethylphthalate	12	Ŭ	Indeno(1,2,3-cd)pyrene	12	Ü
2,6-Dinitrotoluene	12	Ŭ	Dibenzo(a,h)anthracene	12	Ŭ
Acenaphthylene	12	Ŭ	Benzo(ghi)perylene	12	Ŭ
3-Nitroaniline	12	Ŭ	Zeme (gin)per from	12	O
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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9348A2

QC Type: Laboratory Method Blank

Project Officer: Guy Barrett

Date Prepared: 12/14/99 Date Analyzed: 12/23/99 Method:

Matrix: Sediment/Soil

Units:

Surrogate Recoveries

2-Fluorophenol	67	%
D5-Phenol	62	%
D4-2-Chlorophenol	63	%
1,2-Dichlorobenzene-D4	68	%
D5-Nitrobenzene	68	%
2-Fluorobiphenyl	68	%
Pyrene-D10	73	%
Terphenyl-D14	76	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498082 Field ID: LARSS3A03

Date Collected: 12/09/99

Method: SW8270 Matrix: Water

Project Officer: Guy Barrett

Date Prepared: 12/14/99 Date Analyzed: 12/23/99 Units: ug/L

Analyte	Result	Qualifier	· · · · · · · · · · · · · · · · · · ·	Result	Qualifier
N-Nitrosodimethylamine	.067	U	Acenaphthene	.067	U
Pyridine	.067	Ŭ	2,4-Dinitrophenol	1.3	Ŭ
Aniline	.067	Ŭ	4-Nitrophenol	.067	Ŭ
Phenol	.067	Ŭ	Dibenzofuran	.067	Ŭ
Bis(2-Chloroethyl)Ether	.067	Ŭ.	2,4-Dinitrotoluene	.067	Ŭ
2-Chlorophenol	.067	Ŭ	Diethylphthalate	.17	
1,3-Dichlorobenzene	.067	Ŭ	Fluorene	.067	U
1,4-Dichlorobenzene	.067	Ŭ	4-Chlorophenyl-Phenylether	.067	Ŭ
1,2-Dichlorobenzene	.067	Ŭ	4-Nitroaniline	.067	Ŭ
Benzyl Alcohol	.067	Ŭ	4,6-Dinitro-2-Methylphenol	.13	Ŭ
2-Methylphenol	.067	Ŭ	N-Nitrosodiphenylamine	.067	Ŭ
2,2'-Oxybis[1-chloropropane]	.067	Ŭ	1,2-Diphenylhydrazine	.067	Ŭ
N-Nitroso-Di-N-Propylamine	.067	Ŭ	4-Bromophenyl-Phenylether	.067	Ŭ
4-Methylphenol	.067	Ŭ	Hexachlorobenzene	.067	Ŭ
Hexachloroethane	.067	Ŭ	Pentachlorophenol	.067	Ŭ
Nitrobenzene	.067	Ŭ	Phenanthrene	.0096	Ĵ
Isophorone	.067	Ŭ	Anthracene	.067	Ŭ
2-Nitrophenol	.067	Ŭ	Caffeine	.067	Ŭ
2,4-Dimethylphenol	.067	Ü	Carbazole	.067	Ŭ
Bis(2-Chloroethoxy)Methane	.067	Ŭ	Di-N-Butylphthalate	.18	· ·
Benzoic Acid	1.3	Ü	Fluoranthene	.067	U
2,4-Dichlorophenol	.067	Ŭ	Benzidine	.067	Ŭ
1,2,4-Trichlorobenzene	.067	Ŭ	Pyrene	.067	Ŭ
Naphthalene	.067	Ŭ	Retene	.067	Ŭ
4-Chloroaniline	.067	Ŭ	Butylbenzylphthalate	.067	Ŭ ·
Hexachlorobutadiene	.067	Ŭ	Benzo(a)anthracene	.067	บั
4-Chloro-3-Methylphenol	.067	Ŭ	3,3'-Dichlorobenzidine	.067	Ŭ
2-Methylnaphthalene	.067	Ŭ	Chrysene	.067	Ŭ
1-Methylnaphthalene	.067	Ŭ	Bis(2-Ethylhexyl) Phthalate	.072	O
Hexachlorocyclopentadiene	.067	Ŭ	Di-N-Octyl Phthalate	.067	U
2,4,6-Trichlorophenol	.067	Ü	Benzo(b)fluoranthene	.067	Ŭ
2,4,5-Trichlorophenol	.067	Ŭ	Benzo(k)fluoranthene	.067	Ŭ
2-Chloronaphthalene	.067	Ŭ	Benzo(a)pyrene	.067	บั
2-Nitroaniline	.067	Ŭ	3B-Coprostanol	.13	Ŭ ·
Dimethylphthalate	.067	Ū	Indeno(1,2,3-cd)pyrene	.067	Ŭ
2,6-Dinitrotoluene	.067	Ü	Dibenzo(a,h)anthracene	.067	Ŭ
Acenaphthylene	.067	Ŭ	Benzo(ghi)perylene	.067	Ŭ
3-Nitroaniline	.067	U	Delizo(Bin) per yiene	.007	١
	.007	U			

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Sample: 99498082 Date Collected: 12/09/99 Method: SW8270 Field ID: LARSS3A03 Date Prepared: 12/14/99 Matrix: Water Project Officer: Guy Barrett Date Analyzed: 12/23/99 Units: ug/L

Surrogate Recoveries

2-Fluorophenol	•	51	%
D5-Phenol		29	%
D4-2-Chlorophenol		78	%
1,2-Dichlorobenzene-D4		54	%
D5-Nitrobenzene		83	%
2-Fluorobiphenyl		66	- %
Pyrene-D10		88	%
Terphenyl-D14		93	%

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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBW9348B1

Method:

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Prepared: 12/14/99 Date Analyzed: 12/23/99

Matrix: Ampules -> water

Units: ug/L

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	.067	U	Acenaphthene	.067	U
Pyridine	.067	U	2,4-Dinitrophenol	1.3	Ŭ
Aniline	.067	Ū.	4-Nitrophenol	.067	Ū
Phenol	.044	J	Dibenzofuran	.067	Ü
Bis(2-Chloroethyl)Ether	.067	Ū	2,4-Dinitrotoluene	.067	U
2-Chlorophenol	.067	U	Diethylphthalate	.022	J
1,3-Dichlorobenzene	.067	U	Fluorene	.067	Ŭ
1,4-Dichlorobenzene	.067	U	4-Chlorophenyl-Phenylether	.067	Ū
1,2-Dichlorobenzene	.067	U	4-Nitroaniline	.067	Ū
Benzyl Alcohol	.067	U	4,6-Dinitro-2-Methylphenol	.13	Ü
2-Methylphenol	.067	Ü	N-Nitrosodiphenylamine	.067	Ü
2,2'-Oxybis[1-chloropropane]	.067	Ū	1,2-Diphenylhydrazine	.067	Ū
N-Nitroso-Di-N-Propylamine	.067	Ŭ	4-Bromophenyl-Phenylether	.067	Ū.
4-Methylphenol	.067	U	Hexachlorobenzene	.067	Ū
Hexachloroethane	.067	Ü	Pentachlorophenol	.067	,Ū
Nitrobenzene	.067	Ū	Phenanthrene	.067	Ū
Isophorone	.067	Ŭ	Anthracene	.067	Ū
2-Nitrophenol	.067	Ū	Caffeine	.067	Ū
2,4-Dimethylphenol	.067	Ŭ	Carbazole	.067	Ū
Bis(2-Chloroethoxy)Methane	.067	Ū	Di-N-Butylphthalate	.017	Ĵ
Benzoic Acid	1.3	Ŭ	Fluoranthene	.067	Ü
2,4-Dichlorophenol	.067	Ŭ	Benzidine	.067	Ü
1,2,4-Trichlorobenzene	.067	Ū	Pyrene	.067	Ū
Naphthalene	.067	Ŭ	Retene	.067	Ŭ
4-Chloroaniline	.067	Ŭ	Butylbenzylphthalate	.017	$oldsymbol{\check{\mathbf{J}}}$
Hexachlorobutadiene	.067	Ŭ	Benzo(a)anthracene	.067	Ŭ
4-Chloro-3-Methylphenol	.067	Ŭ	3,3'-Dichlorobenzidine	.067	Ŭ
2-Methylnaphthalene	.067	Ŭ	Chrysene	.067	Ŭ
1-Methylnaphthalene	.067	Ŭ	Bis(2-Ethylhexyl) Phthalate	.067	Ŭ
Hexachlorocyclopentadiene	.067	Ŭ	Di-N-Octyl Phthalate	.067	Ŭ
2,4,6-Trichlorophenol	.067	Ŭ	Benzo(b)fluoranthene	.067	Ŭ
2,4,5-Trichlorophenol	.067	Ŭ	Benzo(k)fluoranthene	.067	Ŭ
2-Chloronaphthalene	.067	Ŭ	Benzo(a)pyrene	.067	Ŭ
2-Nitroaniline	.067	Ŭ	3B-Coprostanol	.13	ÜJ
Dimethylphthalate	.067	Ŭ	Indeno(1,2,3-cd)pyrene	.067	Ü
2,6-Dinitrotoluene	.067	Ŭ	To the company of the control of the	.067	Ŭ
	.067	Ü	Benzo(ghi)perylene	.067	· U
Acenaphthylene	1127				

Authorized By:	766
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Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBW9348B1

Method:

QC Type: Laboratory Method Blank

Date Prepared: 12/14/99

Project Officer: Guy Barrett

Matrix: Ampules -> water

Date Analyzed: 12/23/99 **Units:** ug/L

Surrogate Recoveries

2-Fluorophenol	81	%
D5-Phenol	59	%
D4-2-Chlorophenol	83	%
1,2-Dichlorobenzene-D4	46	%
D5-Nitrobenzene	88	%
2-Fluorobiphenyl	73	%
Pyrene-D10	88	%
Terphenyl-D14	99	%

Authorized By:	768	

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name: Fuds Larson S-3 - 49 LIMS Project ID: 3113-99

Lab ID: OBW9348B2

Method:

QC Type: Laboratory Method Blank Project Officer: Guy Barrett

Date Prepared: 12/14/99

Matrix: Ampules -> water

Date Analyzed: 12/23/99 **Units:** ug/L

Analyte	Result	Qualifier	Analyte	Result	Qualifier
N-Nitrosodimethylamine	.067	U	Acenaphthene	.067	U
Pyridine	.067	${f U}$	2,4-Dinitrophenol	1.3	Ū
Aniline	.067	${f U}$	4-Nitrophenol	.067	Ū
Phenol	.067	${f U}$	Dibenzofuran	.067	Ū
Bis(2-Chloroethyl)Ether	.067	U	2,4-Dinitrotoluene	.067	U
2-Chlorophenol	.067	U	Diethylphthalate	.02	J
1,3-Dichlorobenzene	.067	U	Fluorene	.067	Ū
1,4-Dichlorobenzene	.067	· U	4-Chlorophenyl-Phenylether	.067	U
1,2-Dichlorobenzene	.067	·U	4-Nitroaniline	.067	U
Benzyl Alcohol	.067	U	4,6-Dinitro-2-Methylphenol	.13	U
2-Methylphenol	.067	U	N-Nitrosodiphenylamine	.067	U
2,2'-Oxybis[1-chloropropane]	.067	U	1,2-Diphenylhydrazine	.067	Ü
N-Nitroso-Di-N-Propylamine	.067	U	4-Bromophenyl-Phenylether	.067	U
4-Methylphenol	.067	U	Hexachlorobenzene	.067	U
Hexachloroethane	.067	U	Pentachlorophenol	.067	U
Nitrobenzene	.067	U	Phenanthrene	.067	U ·
Isophorone	.067	U	Anthracene	.067	U
2-Nitrophenol	.067	U .	Caffeine	.067	U
2,4-Dimethylphenol	.067	U	Carbazole	.067	U
Bis(2-Chloroethoxy)Methane	.067	U	Di-N-Butylphthalate	.018	J
Benzoic Acid	1.3	U	Fluoranthene	.067	Ū
2,4-Dichlorophenol	.067	U	Benzidine	.067	U
1,2,4-Trichlorobenzene	.067	U	Pyrene	.016	J
Naphthalene	.067	Ū	Retene	.067	U
4-Chloroaniline	.067	U	Butylbenzylphthalate	.013	$\dot{f J}$
Hexachlorobutadiene	.067	${f U}$	Benzo(a)anthracene	.067	Ū
4-Chloro-3-Methylphenol	.067	Ŭ	3,3'-Dichlorobenzidine	.067	Ŭ .
2-Methylnaphthalene	.067		Chrysene	.067	Ŭ
1-Methylnaphthalene	.067	Ū	Bis(2-Ethylhexyl) Phthalate	.067	Ŭ.
Hexachlorocyclopentadiene	.067	Ŭ	Di-N-Octyl Phthalate	.067	Ŭ
2,4,6-Trichlorophenol	.067	Ŭ	Benzo(b)fluoranthene	.067	Ŭ
2,4,5-Trichlorophenol	.067	Ŭ	Benzo(k)fluoranthene	.067	Ŭ
2-Chloronaphthalene	.067	Ŭ	Benzo(a)pyrene	.067	Ŭ
2-Nitroaniline	.067	Ŭ	3B-Coprostanol	.13	ŬJ
Dimethylphthalate	.067	Ü	Indeno(1,2,3-cd)pyrene	.067	Ü
2,6-Dinitrotoluene	.067	Ŭ	Dibenzo(a,h)anthracene	.067	Ü
Acenaphthylene	.067	Ŭ	Benzo(ghi)perylene	.067	Ŭ
3-Nitroaniline	.067	Ŭ	(O)kar14am	.007	~ ,
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Release Date:

1/24/00

Department of Ecology

Analysis Report for

Base/Neutral/Acids

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBW9348B2

QC Type: Laboratory Method Blank

Date Prepared: 12/14/99

Method:

Project Officer: Guy Barrett

Matrix: Ampules -> water

Date Analyzed: 12/23/99 **Units:** ug/Ĺ

Surrogate Recoveries

2-Fluorophenol	81	%
D5-Phenol	59	%
D4-2-Chlorophenol	82	%
1,2-Dichlorobenzene-D4	46	%
D5-Nitrobenzene	87	%
2-Fluorobiphenyl	73	%
Pyrene-D10	92	%
Terphenyl-D14	98	%

Authorized By:

Release Date: 1/27/00

Page:

7411 Beach DR E, Port Orchard Washington 98366

CASE NARRATIVE

December 29, 1999

Subject:

FUDS Larson S-3 - 49

Sample:

99498086

Case No.

3113-99

Officer:

Guy Barrett

By:

M. Mandjikov M

PCB Results for the FUDS Larson Sediment Sample

SUMMARY:

No evidence of any PCB Arochlors were found in this sample.

All data are usable as reported.

METHODS:

Each sample was extracted into acetone using a Soxhlet apparatus and then solvent exchanged into hexane. The extracts were then eluted through a Florisil® column with 100% hexane. After the Florisil® column cleanup, the extract was solvent exchanged to iso-octane, concentrated, and treated with elemental mercury to remove sulfur. Prior to GC-ECD analysis, the extracts were treated with concentrated sulfuric acid.

These methods are modifications of EPA SW-846 methods 3545, 3620, and 8082.

BLANKS:

No target analytes were detected in the blanks.

SURROGATES:

All samples and blanks were spiked with 4,4-Dibromooctafluorobiphenyl (DBOB) and Decachlorobiphenyl (DCB) prior to extraction. All surrogate recoveries are within the acceptable range of 50% - 150% of the spiked value.

DUPLICATE SAMPLES, SPIKED AND SPIKED DUPLICATE SAMPLES:

Four replicates of this sample were prepared. Two of the replicates were spiked with Arochlor 1260 to provide a measure of the accuracy and precision of this method. No analytes were detected in the unspiked replicates.

All spike recoveries were within the laboratory control limits of 50% - 150% of the reference value.

The relative percent difference (RPD) between the results of the spiked samples is 7%.

HOLDING TIMES:

The samples were analyzed within the recommended holding times.

DATA QUALIFIERS:

Code Definition

- **E** Reported result is an estimate because it exceeds the calibration.
- J The analyte was positively identified. The associated numerical result is an estimate.
- N There is evidence the analyte is present in this sample.
- **NJ** There is evidence that the analyte is present. The associated numerical result is an estimate.
- **REJ** The data are unusable for all purposes.
- U The analyte was not detected at or above the reported result.
- UJ The analyte was not detected at or above the reported estimated result.
- **Bold Type** The analyte was present in the sample. Used as a visual aid to locate detected compounds on the report sheet.

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498086

Method: SW8082

Field ID: LARSS3E01

Project Officer: Guy Barrett

Date Collected: 12/09/99 **Date Prepared:** 12/14/99

Matrix: Sediment/Soil

Date Analyzed: 12/23/99

Units:

ug/Kg dw

Analyte	Result	Qualifier				
pgp 1016	20	T 7 ·				
PCB - 1016	30	U				-
PCB - 1221	30	U				
PCB - 1232	30	\mathbf{U}_{-}				
PCB - 1242	30	U				
PCB - 1248	30	\mathbf{U}				
PCB - 1254	30	\mathbf{U}				•
PCB - 1260	30	${f U}$				
				•		
Surrogate Recoveries						
4,4-Dibromooctafluorobiphenyl	70	%				
Decachlorobiphenyl	83	%			•	

Page:

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498086 (Duplicate - LDP1)

Date Collected: 12/09/99

Method: SW8082

Field ID: LARSS3E01

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Prepared: 12/14/99

Date Analyzed: 12/23/99

Units:

ug/Kg dw

Analyte	Result	Qualifier
- CD 1016		
PCB - 1016	29	
PCB - 1221	29	U
PCB - 1232	29	U
PCB - 1242	29	U
PCB - 1248	29	U
PCB - 1254	29	${f U}$
PCB - 1260	29	U
Surrogate Recoveries		·
4,4-Dibromooctafluorobiphenyl	71	%
Decachlorobiphenyl	84	%

Authorized By: M. Affarefi Kov-

Release Date: 7

Page:

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Fuds Larson S-3 - 49 **Project Name:**

LIMS Project ID: 3113-99

Sample: 99498086 (Matrix Spike - LMX1) Date Collected: 12/09/99

Method: SW8082

Field ID: LARSS3E01

Date Prepared: 12/14/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/23/99

Units:

% Recovery

Result Qualifier

PCB - 1260

Analyte

89

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl 74 Decachlorobiphenyl 87 % %

Authorized By:

Release Date:

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Sample: 99498086 (Matrix Spike - LMX2) Date Collected: 12/09/99

Method: SW8082

Field ID: LARSS3E01

Matrix:

Project Officer: Guy Barrett

Date Prepared: 12/14/99 Date Analyzed: 12/23/99

Units:

Sediment/Soil % Recovery

Analyte

Result Qualifier

PCB - 1260

83

Surrogate Recoveries

4,4-Dibromooctafluorobiphenyl **Decachlorobiphenyl**

64

82-

Authorized By:

Release Date:

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9348B1

Method: SW8082

QC Type: Laboratory Method Plank Project Officer: Guy Barrett

Date Prepared: 12/14/99

Matrix: Sediment/Soil

Date Analyzed: 12/23/99

Units: ug/Kg dw

Analyte	Result	Qualifier
PCB - 1016	30	U
PCB - 1221	30	U
PCB - 1232	30	U
PCB - 1242	30	U
PCB - 1248	30	U
PCB - 1254	30	Ü
PCB - 1260	30	U
Surrogate Recoveries		

4,4-Dibromooctafluorobiphenyl	79	%	
Decachlorobiphenyl	96	%	

Release Date:

Department of Ecology

Analysis Report for

Polychlorinated Biphenyls

Project Name:

Fuds Larson S-3 - 49

LIMS Project ID: 3113-99

Lab ID: OBS9348B2

Method: SW8082

QC Type: Laboratory Method Blank

Date Prepared: 12/14/99

Matrix: Sediment/Soil

Project Officer: Guy Barrett

Date Analyzed: 12/23/99

Units: ug/Kg dw

Analyte	Result	Qualifier			 		
PCB - 1016	30	U	•				
PCB - 1221	30	Ŭ					
PCB - 1232	30	Ū					
PCB - 1242	30	U		-			
PCB - 1248	30	U					
PCB - 1254	30	U	•			•	
PCB - 1260	30	U					
Surrogate Recoveries							
4,4-Dibromooctafluorobiphenyl	86	%					
Decachlorobiphenyl	99	%	* - 1		•		

Authorized By: M. Monely

Release Date:



I. Conclusions

The Washington State Department of Ecology investigated the FUDS Larson AFB Titan Missile Facility S-3 on December 9, 1999. Based on results from laboratory analysis of samples taken at this site, Ecology did not find exceedances of hazardous materials in the soil or confined water at this site. Ecology therefore concurs with the No Further Action (NOFA) required determination made by the Seattle District Corps of Engineers at the FUDS Larson AFB Titan Missile Facility S-3, and will update its database to reflect this.

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